Morphometrics of Wild Turkeys in North Dakota

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Abstract: Wild Turkeys (*Meleagris gallopavo* L.) were introduced to North Dakota in the 1950s and 1960s. Today, the population of turkeys in North Dakota appears to be stable or increasing based on increased human-turkey interactions and conflict. This study aims to understand current Wild Turkey morphometrics across the state as part of an ongoing research project into the survival, movement, and reproduction of translocated turkeys in North Dakota. All Wild Turkeys were captured from 1 January to 31 March 2023 and 2024. Data collected at time of capture includes age, sex, weight, keel score, wing chord length, and snood length. Beard and spur length were recorded for all males and females that exhibited the trait. These measurements were compared against historical records from North Dakota and surrounding states (Johnson and Knue 1989). We conclude that Wild Turkeys in North Dakota are comparable in size to other recent observations. However, our results suggest that weight, wing chord, snood length, and spur length differed significantly across capture counties within North Dakota.

Introduction

The *Meleagris gallopavo* L. (Wild Turkey) is a large and well-recognized game bird native to North America, known both for its cultural, economic, and historical significance (Chamberlain et al. 2022). Originally, they inhabited forests and riparian areas alongside grasslands ranging from the eastern coast of the United States to areas of Arizona and Colorado (Porter 1992, Stangel et al. 1992). During historical population declines, turkeys have been reintroduced using translocated birds from other established populations and pen-raised birds with the primary intent of forming huntable populations (Johnson and Knue 1989). It is important to note that releases using pen-raised turkeys were largely unsuccessful (Johnson and Knue 1989). As a result, translocation efforts were most successful at establishing turkey populations in areas outside of their native range (Johnson and Knue 1989, Minnesota Department of Natural Resources 2008, NRCS 1999). In addition to stocked birds, Wild Turkeys have naturally expanded their range north and westward into the northern Great Plains states, such as North Dakota (Chamberlain et al. 2022). While Wild Turkeys are not native to North Dakota, *M. g. silvestris* (Eastern Wild Turkeys), *M. g. merriami* (Merriam's Wild Turkey), and *M. g. intermedia* (Rio Grande Wild Turkey) subspecies were released in the state during the 1950s and 1960s (Johnson and Knue 1989). Stocking rates of birds varied across subspecies, locations, and years. Minimal information was recorded on turkey translocations and releases in the state as it was primarily done by private entities (Johnson and Knue 1989). The North Dakota Game and Fish Department did not get involved until 1958, after which the agency provided more detailed records and accounts (Johnson and Knue 1989).

Since their introduction to North Dakota, there has been little effort placed on formal population estimations of Wild Turkey populations in the state. At the time of the first North Dakota turkey hunting season in 1958, the population was estimated to be 1,000 to 3,000 individuals (Johnson and Knue 1989). Since then, the North Dakota Game and Fish Depart-

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ment (NDGF) has relied on hunter-harvest data, human-turkey interactions, opportunistic roadside and aerial counts, and surrounding states' programs to inform management decisions regarding Wild Turkeys.

In recent years, there has been an increase in nuisance turkey reports by private landowners to the North Dakota Game and Fish Department (R. A. Gross, North Dakota Game and Fish Department, Bismarck, ND, 2022 pers. comm.). It is important to note that NDGF has been receiving these nuisance reports since Wild Turkeys were introduced in the 1950s (Johnson and Knue 1989). Many of these complaints occur in the winter months when birds are more frequently found in livestock feedlots, fields, silage, and bird feeders in search of easy forage (Restani et al. 2009). Winters with large amounts of snowfall and extreme cold, which are common in North Dakota, are likely to force high caloric demands on the birds (Haroldson et al. 1998). Research on female turkeys suggests that a hen would require an extra 20 g of food per day for every 10°C below a critical temperature of 10.9°C (Haroldson et al. 1998). NDGF reports that North Dakota experiences an average of 50 days per year below -18°C, creating a large period where an individual bird needs almost 60 g of extra food daily (North Dakota Game and Fish Department 2017). With an increase in thermal demands for turkeys compared to most parts of their native range, it is important to understand basic natural history traits of turkeys at the northern expansions of their current range. Recording and describing morphological measurements can shed light on whether physiological needs are being met within a population and offer some insight on a population's physical health.

There is limited natural history and other demographic information available on Wild Turkeys at the northern extent of their expanded range. While extensive measurements have been done on Wild Turkeys across their historic range (e.g., Pelham and Dickson 1992), the only study known to report morphometric information in the northernmost extent of their expanded range is Johnson and Knue (1989). They examined winter-trapped and relocated turkeys and collected measurements on 54 adult males, 139 juvenile males, 199 adult females, and 248 juvenile females from 1980 to 1988. To our knowledge, there has been one recent publication on turkeys done in North Dakota that focused on distribution of turkeys in the state (Courlas and Lutz 2018). Courlas and Lutz (2018) determined that turkeys were associated with wooded riparian areas. As a result, we used an ongoing translocation study of nuisance Wild Turkeys in North Dakota with NDGF to investigate the morphometrics of these birds from across the state to provide insights on turkeys in the northern extend of their expanded range. This paper aims to document the body conditions (weight and keel score) of these recently caught turkeys and compare to historic records of winter-captured turkeys reported by Johnson and Knue (1989) in North Dakota and nationally (Pelham and Dickson 1992).

Materials and Methods

As part of an ongoing collaborative research project evaluating the effectiveness of the NDGF trap and transport program to handle nuisance Wild Turkeys, we captured turkeys from eight unique sites across seven counties within the state (Fig. 1). All Wild Turkeys were captured and handled from 1 January to 31 March 2023 and 2024 during trap and translocation efforts of nuisance turkeys. Birds were captured using baited rocket-net traps or walk-in traps with remote triggers. The University of North Dakota's Institutional Animal Care and Use Committee (IACUC2207-0033) approved all Wild Turkey capture, handling, and release efforts. Once birds were captured, an aluminum band was placed on their leg with a unique identifying number and a phone number for the NDGF to report bird harvest or recovery of the band. Basic biological information such as age and sex were determined

using primary feathers, breast feathers, and other identifying physical characteristics of each bird (Pelham and Dickson 1992). Additionally, morphological information was recorded for each bird. Birds were placed individually into a National Wild Turkey Federation (NWTF) waxed cardboard transportation box and weighed using a handheld scale. The weight of the box was subtracted from the weight of the turkey and box to determine weight of the turkey. A keel score was determined for each bird to understand body condition and muscle density along the keel (Devoe and Reininger 2006). Since a keel score can be subjective, two to three individuals all independently scored each bird, where a consensus score was recorded to minimize research bias. Wing chord and snood length was measured for all birds, and we measured beard and spur length for males and females that exhibited those characteristics. Measurements were recorded in kilograms (weight), centimeters (wing chord, beard length, spur length), and millimeters (snood length). To minimize stress, a hood was placed over the eyes of the turkey while they were measured and tagged. The average handling and processing time was 10 minutes per bird.

We calculated summary statistics to provide an overview of the Wild Turkey morphometrics in RStudio (RStudio Team 2020). To determine the significance of the eight study locations on the bird's morphometrics (weight, wing chord, spur length, beard length, and snood length), four one-way analyses of variance (ANOVA) were performed. Collected bird data was separated into four demographic groups (adult males, adult females, juvenile

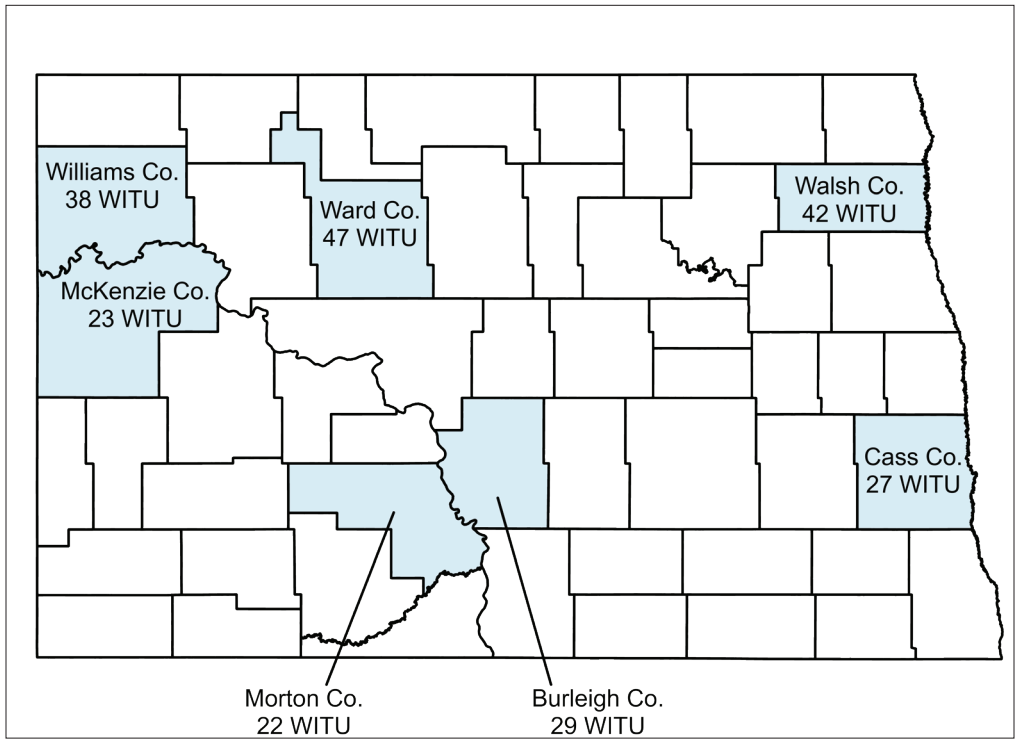

Figure 1. Counties in North Dakota Wild Turkeys were captured from are highlighted. The number of individual Wild Turkeys (WITU) captured is represented under the county name. All captured birds were measured for weight (kg), wing chord (cm), beard length (cm), spur length (cm), snood length (mm), and keel score. Two capture sites were located within Ward Co., accounting for 26 and 21 birds, respectively. All Wild Turkeys were captured and sampled during the months of January–March in 2023 and 2024.

males, and juvenile females) and then run against each measurement. When statistical significance was identified from the ANOVA, a Tukey range test was conducted to determine which locations were statistically different from one another within each data group. A Bonferroni correction was also run using statistically significant values to reduce the likelihood of a false positive and confirm significance of variables (Armstrong 2014).

Due to the lack of detailed data from historical releases, gathered results were contextualized against prior recordings by Johnson and Knue (1989) to infer changes in morphometrics in the past decades. Data collected in Missouri by Vangilder and Kurzejeski (1995) as well as nationally by Pelham and Dickinson (1992) were included to compare against other regions (Table 1). Following Bergmann's rule, we hypothesized birds would be larger in more northern ranges (Bergmann 1847).

Results

Over 15 trapping days across two trapping seasons (January – March) in 2023 and 2024, a total of 228 (n = 112 in 2023, n = 116 in 2024). Wild Turkeys were captured across seven counties in North Dakota (Fig. 1). Data included 96 adult females, 76 juvenile females, 12 adult males, and 44 juvenile males. It is important to note that the capture efforts were targeted towards female turkeys to achieve high sample sizes for other ongoing research objectives relating to Wild Turkey reproduction and as a result the adult male sample size is disproportionately lower than the other demographic groups. Therefore, this sample should not be used as an accurate representation of the age and sex ratios within Wild Turkey populations in the state.

Adult males had the largest average weight, wing chord, snood length, beard length, and spur length (Table 2). Adult females had the highest median keel score (Table 2).

We found that 10 of the 96 adult female turkeys had beards (Table 3). No bearded juvenile females were captured. Female turkeys with beards came from five of the seven capture counties (Table 3). Of this group, 5 were captured in Cass County (southeastern North Dakota), which had a total of 25 adult females captured. Of the 121 adult and juvenile females, only three (n = 2 adult females, n = 1 juvenile female) individuals had spurs (Table 4). All spurred hens were from one capture site located in Williams County (northwestern North Dakota).

From the one-way ANOVA, we found a significant difference ($P < 0.05$) among turkey capture sites on several variables (Table 5). Spurred hens were omitted from the testing due

Table 1. Average weights in kilograms of Wild Turkeys for all sex and age groups across referenced sources. Standard deviation is included when available. All Wild Turkeys included in collections from this study were captured and sampled during the months of January–March in 2023 and 2024 in North Dakota.

	Study location	Adult female	Adult male	Juvenile female	Juvenile male
Collected measurements (2023-2024)	North Dakota	4.58 ± 0.62	8.75 ± 0.72	3.64 ± 0.41	6.01 ±0.86
Pelham and Dickinson (1992)	National	4.3	8.6	3.4	6.8
Johnson and Knue (1989)	North Dakota	4.17	7.94	3.45	4.17
Vangilder and Kurzejeski (1995)	Missouri	4.7	8.9	3.85	6.4

Table 2. Averages of all measured morphometric data for all birds sampled for females (F), males (M), adults (A) and juveniles (J). Hen beard and spur averages are measured only from hens displaying relevant traits. Keel score is represented by median. All Wild Turkeys were captured and sampled during the months of January–March in 2023 and 2024 in North Dakota.

Sex	Age	Weight (kg)	Wing chord (cm)	Spur length (cm)	Beard length (cm)	Snood length (mm)	Keel score
F	A	4.58 ± 0.62	45.97 ± 1.45	0.01 ± 0	11.92 ± 5.67	14.31 ± 6.27	3
M	A	8.75 ± 0.72	48.93 ± 1.84	1.48 ± 0.90	19.79 ± 4.18	27.75 ± 10.28	2
F	J	3.64 ± 0.41	39.86 ± 2.02	0.01 ± 0	*NA*	8.77 ± 3.30	2
M	J	6.01 ±0.86	46.54 ± 1.20	0.43 ± 0.91	5.19 ± 11.84	22.05 ± 8.73	2

Table 3. Morphometric measurements for all ten hens that displayed a beard. All Wild Turkeys were captured and sampled during the months of January–March in 2023 and 2024 in North Dakota.

Source County	Sex	Age	Weight (kg)	Wing chord (cm)	Spur length (cm)	Beard length (cm)	Snood length (mm)	Keel score
Cass	F	A	5.20	42.5	0	18.0	17	4
Cass	F	A	5.30	42.5	0	18	19	3
Cass	F	A	5.41	43.5	0	13.5	18	4
Cass	F	A	4.67	41	0	11.5	15	3
Cass	F	A	5.16	40	0	5.6	17	2
Morton	F	A	4.45	38.6	0	15.5	18	2
Ward A	F	A	3.31	42.0	0	5.2	10	3
Ward B	F	A	4.44	43.5	0	18.4	14	3
Ward B	F	A	4.95	43	0	3.6	10	4
Williams	F	A	4.99	42.5	0	9.9	6	1

Table 4. Morphometric measurements for all three hens that displayed spurs. All Wild Turkeys were captured and sampled during the months of January–March in 2023 and 2024 in North Dakota.

Source County	Sex	Age	Weight (kg)	Wing chord (cm)	Spur length (cm)	Beard length (cm)	Snood length (mm)	Keel score
Williams	F	A	4.57	42.6	0.1	0	14	2
Williams	F	A	4.41	42.3	0.1	0	7	1
Williams	F	J	3.96	42.4	0.1	0	2	2

Table 5. Associated metrics of all one-way ANOVA tests run. Each test ran morphometrics of an isolated sex and age group against capture location. Dependent variables were isolated by sex and age demographics (F = Female, M = Male, J = Juvenile, A = Adult). Significant *P*-values ($P < 0.05$) indicated by *. Adult and juvenile female spur results and juvenile female beard results removed due to lack of samples needed for testing.

Test group	Dependent variable	Sum of squares	Df	Mean square	F value	*P*-value
Adult females	Weight	16.02	6	2.67	11.78	1.10e-09*
	Wing chord	33.40	6	5.57	2.99	0.01*
	Beard length	`133.28	6	22.213	1.38	0.23
`	Snood length	2065.9	6	344.32	18.36	9.118e-14*
Juvenile females	Weight	3.74	6	0.62	4.87	0.00033*
	Wing chord	45.58	6	7.60	2.01	0.08
	Snood length	107.27	6	17.88	1.74	0.1256
Adult males	Weight	1.03	3	0.34	0.59	0.64
	Wing chord	6.01	3	2.00	0.51	0.68
	Beard length	27.07	3	9.02	0.44	0.73
	Snood length	911.55	3	303.85	0.44	0.0045*
	Spur length	3.99	3	1.33	2.17	0.17
Juvenile males	Weight	18.36	7	2.62	7.19	2.16e-05*
	Wing chord	17.46	7	2.49	2.04	0.077
	Beard length	1184.50	7	169.21	1.70	0.14
	Snood length	911.55	3	303.85	0.44	0.0045*
	Spur length	18.46	7	2.64	5.47	0.00024*

to being from only one source site, and bearded juvenile hens as none were collected. The test revealed that there was a significant difference in weight of adult females, juvenile females, and juvenile males (Fig. 2), and spur length of juvenile males (Fig. 3), snood length of adult females, adult males, and juvenile males (Fig. 4). Wing chord of adult female birds was also found to be significant by the initial ANOVA test but was suggested to be insignificant by the Bonferroni correction.

Discussion

This study is the first to investigate morphological characteristics of Wild Turkeys in North Dakota in recent years, and one of few in the Northern Great Plains that have thoroughly recorded such natural history data. We found turkeys in North Dakota had comparable weights to those collected across the United States (Pelham and Dickinson 1992, Table 1). However, they were generally smaller than birds recorded in Missouri by Vangilder and Kurzejeski (1995, Table 1). The birds captured during our research weighed heavier on average than those historically released in North Dakota as reported by Johnson and Knue (1989), with the largest difference observed in juvenile males (Johnson and Knue 1989, Table 1). Our study targeted females since it was part of a larger investigation into reproduction, movement,

and survival of translocated turkeys. As a result, only 12 adult males were captured which may not portray an accurate representation of adult males across the state. While similar trends were observed in the weights of birds across all demographic groups when compared to other studies, this small sample size limits statistical analysis among capture counties.

While no formal statistical analysis was conducted, we found weights to be heavier on average than previously reported in North Dakota (Johnson and Knue 1989; Table 1). Juvenile males saw the largest discrepancy in weights in our study compared to the only other previously available data in ND (Johnson and Knue 1989; Table 1). Our samples were similar and within the ranges reported nationally (Pelham and Dickson 1992; Table 1).

Since these were all nuisance birds, this may be the result of the food sources they were exploiting from agricultural areas or even thermal refuges near areas occupied by humans that allowed the birds to grow larger. Most of the birds in this study were captured at or near feedlots that provided high energy and accessible food with minimal effort (Flake et al. 2006). In Minnesota, Wild Turkeys had reduced survival in areas lacking agricultural food sources (Porter and Ludwig 1980). As a result, Wild Turkeys would likely struggle in prairie woodland areas of the Northern Great Plains if it were not for these alternate food sources (Flake et al. 2006).

Another possible reason for this increase in weight between earlier North Dakota records and collected data could be that as turkey populations have settled in the state, they moved from their original release sites to more optimal foraging sites. Initial stocking attempts in the state were of pen-reared and wild-caught birds; while no data exists for where the Eastern or Merriam's Wild Turkeys were raised or trapped, the released Rio Grande turkeys came from Texas and California (Johnson and Knue 1989). Translocation stressors or potential difference in habitat and foraging availability could have further pushed turkeys in North Dakota to seek out easier feed from farms and silage. Of the birds caught in this study, juvenile males saw the most drastic increase compared to their historical weight, with

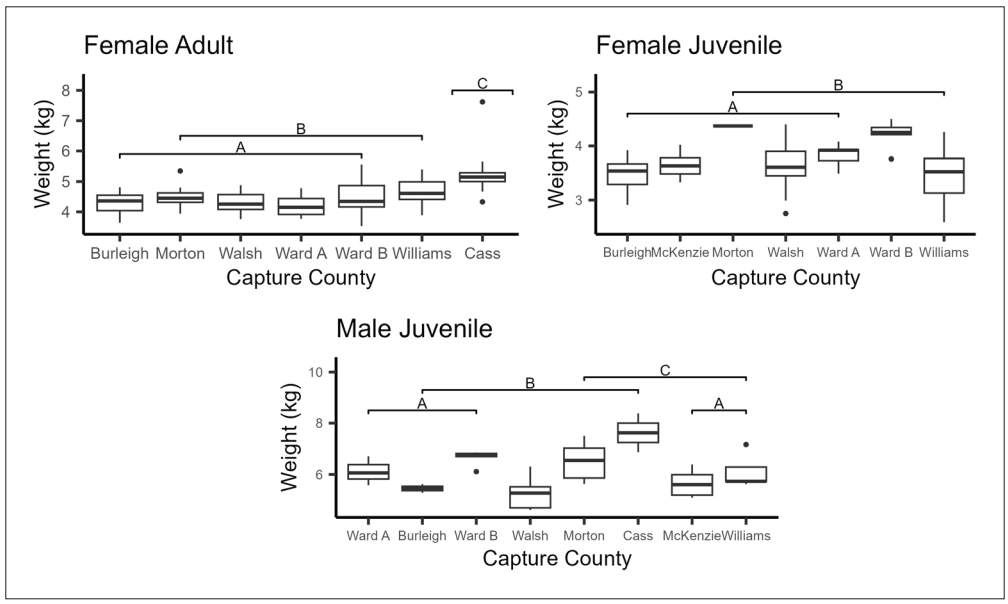

Figure 2. Average weight (kg) of adult female, juvenile female, and juvenile male for captured Wild Turkeys by capture site. Associated letters refer to statistical differences ($P < 0.05$) determined by a Tukey range test. Site counties sharing letters do not differ significantly. All Wild Turkeys were captured and sampled during the months of January–March in 2023 and 2024.

their average being almost 2 kg heavier, though all demographics averaged somewhat larger (Johnson and Knue 1989, Table 1).

Despite this increase in weight, most birds in this study had a median keel score of 2, while only adult females had a median score of 3. Only Ward County had all demographics with a median keel score of 3 or more, ranking within the 3–4 score that is considered healthy (Scott 2016, Table 6). Adult females from Cass and Walsh County in the eastern portion of the state also lay within this "healthy" category for keel scores. The lowest median keel score of 1 for males and juvenile females was found in the two counties near Bismarck (Burleigh and Morton Counties).

As historical North Dakota Wild Turkey releases included birds of multiple subspecies, the current population of birds shows mixed levels of their traits. Turkeys on the eastern side of the state appear more similar to Eastern Wild Turkeys, while those in the southwest of the state are closer to Merriam's Wild Turkey and the northwest appear as intergrades (Chamberlain et al. 2022). According to the National Wild Turkey Federation, these subspecies tend to be the same weight in both male and female, but Eastern Wild Turkeys are noted to have longer beards and spurs than their Merriam counterparts. The extent of subspecies integration in the state is not known, but neither of these differentiable characteristics were found to be significant across capture counties during this study. While genetic and phe-

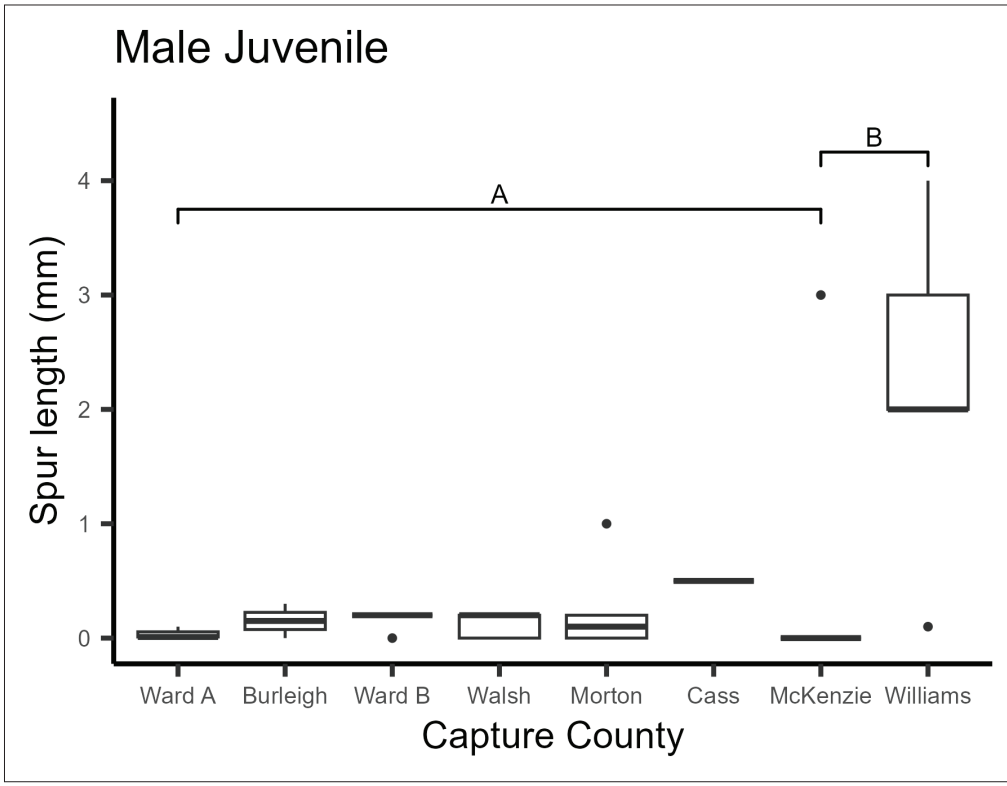

Figure 3. Average spur length (mm) of juvenile male from one-way ANOVA for captured Wild Turkeys by capture site. Associated letters refer to statistical differences ($P < 0.05$) determined by a Tukey range test. Site counties sharing letters do not differ significantly. All Wild Turkeys were captured and sampled during the months of January–March in 2023 and 2024.

notypical differences may exist between these two populations and would require further study, their physical traits have not retained historical separation.

While little research exists on bearded hens, prior studies have found that about 10% of female birds show this trait, often after reaching three to four years of age (Schorger 1957). This percentage mirrors our collected data, with 10.4% of adult female hens displaying beards. Schorger includes the note that some small pockets of populations, citing pen-reared Wild Turkeys, can have much higher prevalence of beards, potentially due to dietary or genetic factors. While no genetic data was collected from the birds in this study, it would be interesting to explore genetic differences across our study sites to further our understanding of inheritability of traits such as beards in female turkeys.

Spurred hens, similarly, have little recorded data about them. In one report, two hens with spurs were described out of a total of 4,000 birds captured (Williams and Austin 1969). While the report does note that trapping personnel had seen spurred hens before, they estimated that around 1% of hens display a spur in the Florida area (Williams and Austin 1969). The high number in this study could be due to the birds originating from a single location. Further research into the factors influencing this trait could provide answers on what causes spur growth in female turkeys and if the number seen here could be due to genetic, environmental, or physiological factors (e.g., hormone levels).

Faced with both changing climate and increased human development, Wild Turkeys have become one of many species whose modern ranges have changed, moving northward from their historical habitats (Niedzielski and Bowman 2015). However, the Northern Plains and forests offer different habitats, forage, and predators than the southeastern and central forests turkeys are native to. In some areas, such as the Black Hills of North Dakota, Merriam's Wild Turkey survival has been found to be similar or higher than in

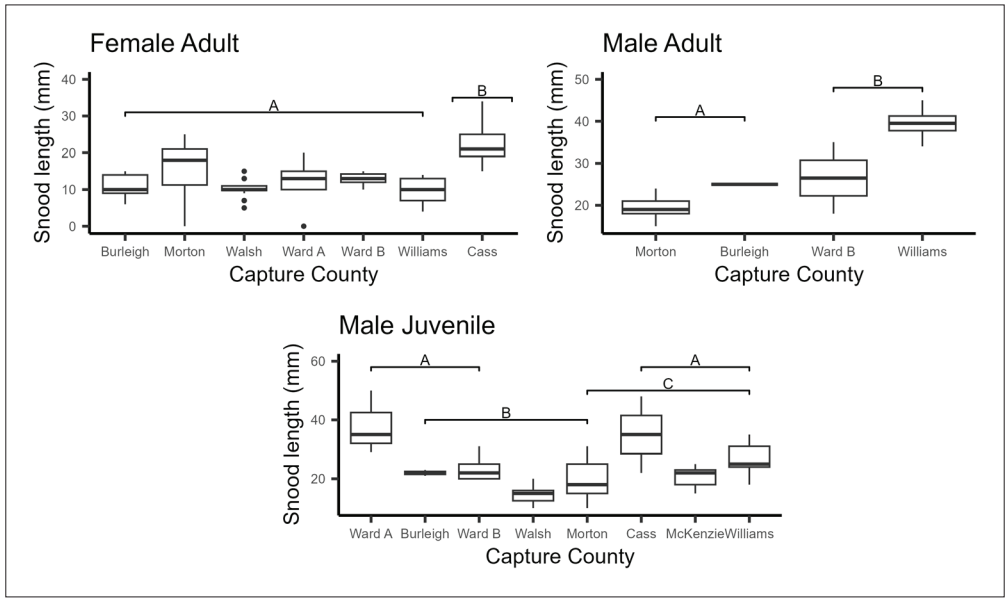

Figure 4. Average snood length (mm) of adult female, adult male, and juvenile male from one-way ANOVA for captured Wild Turkeys by capture site. Associated letters refer to statistical differences ($P < 0.05$) determined by a Tukey range test. Site counties sharing letters do not differ significantly. All Wild Turkeys were captured and sampled during the months of January–March in 2023 and 2024.

Table 6. Averages of all measured morphometric data across source counties for females (F), males (M), adults (A) and juveniles (J). Hen beard and spur averages are calculated only from hens displaying relevant traits. Keel score is represented by median. All Wild Turkeys were captured and sampled during the months of January–March in 2023 and 2024.

Source county	Sex	Age	Weight (kg)	Wing chord (cm)	Spur length (cm)	Beard length (cm)	Snood length (mm)	Keel score
Burleigh	F	A	4.28 ± 0.41	41.96 ± 1.72	*NA*	*NA*	10.89 ± 3.26	2
Burleigh	F	J	3.46 ± 0.32	40.41 ± 1.13	*NA*	*NA*	9.15 ± 2.82	2
Burleigh	M	A	7.89	48.20	0.11	16.50	25.00	1
Burleigh	M	J	5.45 ± 0.24	46.25 ± 0.35	0.15 ± 0.21	5.55 ± 0.64	22.00 ± 1.41	1
Cass	F	A	5.20 ± 0.58	42.44 ± 1.72	*NA*	13.32 ± 5.17	21.68 ± 4.50	3
Cass	M	J	7.62 ± 1.07	47.05 ± 1.34	0.50 ± 0.00	6.60 ± 0.14	35.00 ± 18.38	2
McKenzie	F	J	3.65 ± 0.21	39.14 ± 2.45	*NA*	*NA*	9.69 ± 2.29	2
McKenzie	M	J	5.69 ± 0.50	45.84 ± 1.31	0.33 ± 1.00	3.84 ± 2.35	20.78 ± 3.53	2
Morton	F	A	4.52 ± 0.45	41.49 ± 1.51	*NA*	15.50	15.36 ± 8.73	2
Morton	F	J	4.37	39.50	*NA*	*NA*	15.00	1
Morton	M	A	8.98 ± 0.95	48.90 ± 1.08	1.17 ± 1.08	20.56 ± 4.79	19.40 ± 3.36	2
Morton	M	J	6.55 ± 0.72	46.99 ± 0.78	0.18 ± 0.32	5.09 ± 1.53	19.67 ± 6.93	2
Walsh	F	A	4.31 ± 0.35	65.63 ± 1.31	*NA*	*NA*	10.06 ± 2.43	3
Walsh	F	J	3.66 ± 0.44	40.17 ± 1.46	*NA*	*NA*	7.35 ± 2.03	3
Walsh	M	J	5.13 ± 0.63	47.08 ± 1.00	0.13 ± 0.10	4.84 ± 1.16	14.11 ± 3.79	3
Ward A	F	A	4.10 ± 0.41	41.03 ± 1.06	*NA*	5.20 ± 10.47	12.94 ± 4.72	3
Ward A	F	J	3.83 ± 0.23	37.70 ± 4.92	*NA*	*NA*	9.00 ± 2.24	3
Ward A	M	J	6.12 ± 0.57	45.33 ± 0.76	0.04 ± 0.05	6.00 ± 2.29	38.00 ± 10.82	3
Ward B	F	A	4.48 ± 0.62	42.39 ± 0.63	*NA*	11.00	13.00 ± 1.69	4
Ward B	F	J	4.22 ± 0.25	39.33 ± 1.03	*NA*	*NA*	10.17 ± 2.23	3
Ward B	M	A	8.68 ± 0.95	47.75 ± 0.49	1.70 ± 0.14	17.60 ± 8.34	26.50 ± 12.02	3
Ward B	M	J	6.64 ± 0.30	46.00 ± 1.54	0.16 ± 0.09	5.60 ± 1.55	23.60 ± 4.62	3
Williams	F	A	4.67 ± 0.43	42.77 ± 0.87	0.01 ± 0.00	9.90	9.85 ± 3.69	2
Williams	F	J	3.47 ± 0.44	40.49 ± 1.31	0.01	*NA*	8.06 ± 5.20	2
Williams	M	A	8.70 ± 0.20	49.75 ± 2.96	2.10 ± 0.26	20.75 ± 1.14	39.50 ± 4.51	1.5
Williams	M	J	6.10 ± 0.65	47.20 ± 1.10	2.22 ± 1.45	6.84 ± 1.87	26.60 ± 6.58	2

their historic range (Lehman et al. 2007). In Ontario and Minnesota, Wild Turkey survival was documented as lower with high rates of predation compared to more southern ranges (Niedzielski and Bowman 2015). Within areas of their historic range, however, some states' turkey populations experience high hunting pressure that threatens their stability. Hunter harvest poses a manageable threat across much of the southeastern United States, acting as an additive mortality for the birds; fragmented populations in Indiana face male mortality rates of 46% due to legal harvest alone (Humberg et al. 2009, Wightman et al. 2023).

As Wild Turkeys continue to expand northwards and establish themselves in regions of North Dakota, understanding their body condition across the state could become an important management tool to best support a stable population that balances human conflict and harvest opportunities in the state. This study provides a baseline for comparison so that if turkeys' weights or nutritional status change, improvements in habitat quality and/or quantity or alterations in harvest can be implemented. Future studies into distribution, survival, and behavior can allow for tailored management plans that balance huntable populations while easing and understanding landowner complaints.

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