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Analysis of Dusky Flycatcher's Primary 9 and 5, measurements at Bandelier National Monument, New Mexico

Keegan Tranquillo
P.O. Box 181
Virginville, PA 19564
ktranquillo@hotmail.com

Kara Fox
106 Saltbrush Court
Los Alamos, NM 87544

ABSTRACT

We analyzed measurements taken between the tip of ninth primary and the tip of the fifth primary (p9-p5) on 243 live Dusky Flycatchers (*Empidonax* Jan. - Mar.

oberholseri). Measurements were taken at five banding stations located at Bandelier National Monument in north-central New Mexico. The analysis presented a range of 0.01-4.73 mm with 95% confidence interval. The previous p9-p5 measurements documented for this species ranged between 2.2 - 5.5 mm, based on a minimum of 40 museum specimens.

INTRODUCTION

Species within the flycatcher genus *Empidonax* present identification challenges due to similarities in plumages and measurements. Potential discrepancies between geographic variations within a single species further complicate identification (Pyle 1997a). Wing formulae have

been used and revised over the years to aid in the identification of *Empidonax* flycatchers (Pyle 1997a, 1997b). These detailed measurements used to distinguish species from one another are critical to correctly identifying species of *Empidonax*, especially when in hand.

One of these formulae, p9-p5, measures between the tip of the ninth primary and tip of the fifth primary feather (Pyle 1997a). This measurement is especially helpful for distinguishing between the Dusky Flycatcher (*E. oberholseri*) and other flycatcher species that overlap in distribution and appearance, such as Hammond's Flycatcher (*E. hammondi*) and Least Flycatcher (*E. minimus*). Dusky Flycatchers were the most commonly captured *Empidonax* species in Bandelier National Monument between 2018 and 2020. We present useful information to further aid in Dusky Flycatcher identification based on data on p9-p5 collected.

METHODS

Dusky Flycatchers were captured using standard passive mist netting practices (Ralph et al. 1993) at five different banding stations located within Bandelier National Monument. All stations are within 8000 m of each other ranging from 2100 m to 2700 m. The majority of the birds (n=149) were captured at the fall banding station, Upper Alamo (35.83343° N44348° W, WGS 84, elevation: 2717 m). The birds used for this analysis were captured between August 2018 and August 2020. Birds were captured during both the breeding (May-July) and migratory (August-September) banding seasons, with 76% of banded birds measured in the fall. These measurements accounted for both local and migratory birds, and After Hatching Year (AHY) and Hatching Year (HY) birds. For consistency and accuracy, we only included birds that the lead bird bander (Keegan Tranquillo) personally measured on live birds during this time period. Any Hatching Year birds that were actively growing flight feathers symmetrically in both wings as they complete the pre-juvenile molt were not included. Birds with excessive feather wear (feather tips missing) were also excluded

from this analysis. All measurements were taken on closed wings, measuring the distance between the 9th primary and the 5th primary (p9-p5), using the standard protocol illustrated in Figure 10 in Pyle (1997b). Measurements were taken using an electronic digital caliper to the nearest 0.01 mm, care was taken to be sure the caliper was zeroed before each measurement was taken. The Dusky Flycatchers used in this analysis were identified by the measurements and plumage characteristics given in Pyle (1997b). Experience gained banding a combined 401 individuals of the four *Empidonax* species (Dusky, Hammond's, Cordilleran-- [E.occidentalis], and Gray) most commonly captured at Bandelier over this period of time also contributed greatly in assisting with identifying the notable characteristics for Dusky Flycatchers in hand.

RESULTS

We assembled 2018-2020 data on 243 live birds in hand and found that 120 (49%) birds fell below the bottom range of 2.2 mm listed by Pyle (1997a, 1997b). The p9-p5 measurements for 243 Dusky Flycatchers fell between -0.82 mm and 6.96 mm with a mean of 2.37 mm and standard deviation of 1.18 mm. Negative measurements indicate the p5 is longer than p9, which was only found on two birds. Negative measurements were included in the analysis for the mean and standard deviation as negative numbers. Further analysis found that measurements for p9-p5 fell between 0.01-4.73 mm with a 95% confidence interval (Figure 1).

After Hatching Year (AHY) birds made up for 70 captures, while Hatching Year (HY) birds accounted for 172 captures. One bird was unaged. Measurements for AHY birds had confidence range between 0.33-5.45 mm with a mean of 2.89 mm. Measurements for HY birds had a confidence range between 0.1 to 4.29 mm with a mean of 2.15 mm. Captures were aged by a variety of appropriate methods, skulling, breeding characteristics and plumage.

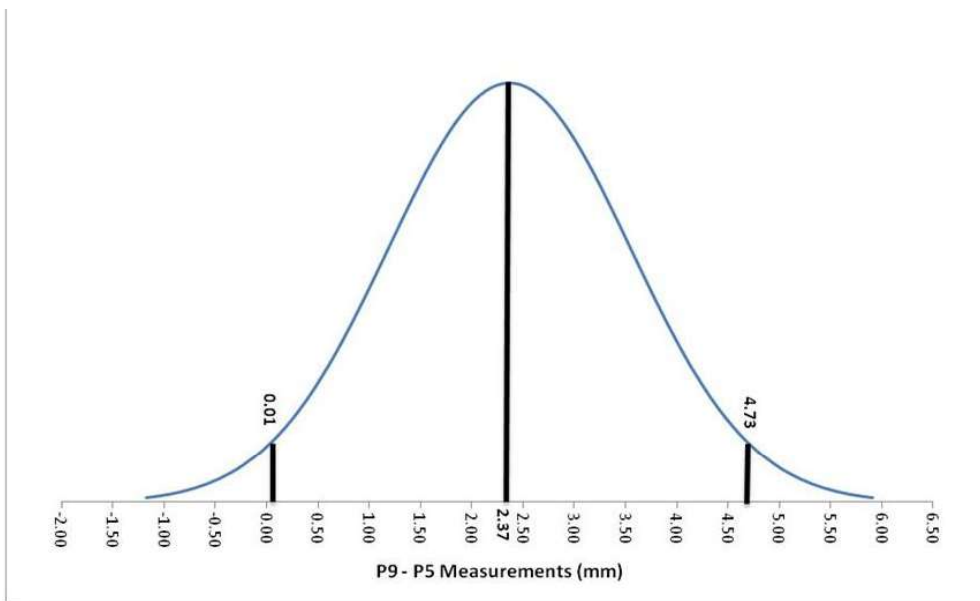


Figure 1.
 Bell curve of the 243 Dusky Flycatchers measurements P9-P5 falling between 0.01-4.73 mm with a 95% confidence interval, as calculated by a mean +/- 2 S.D.

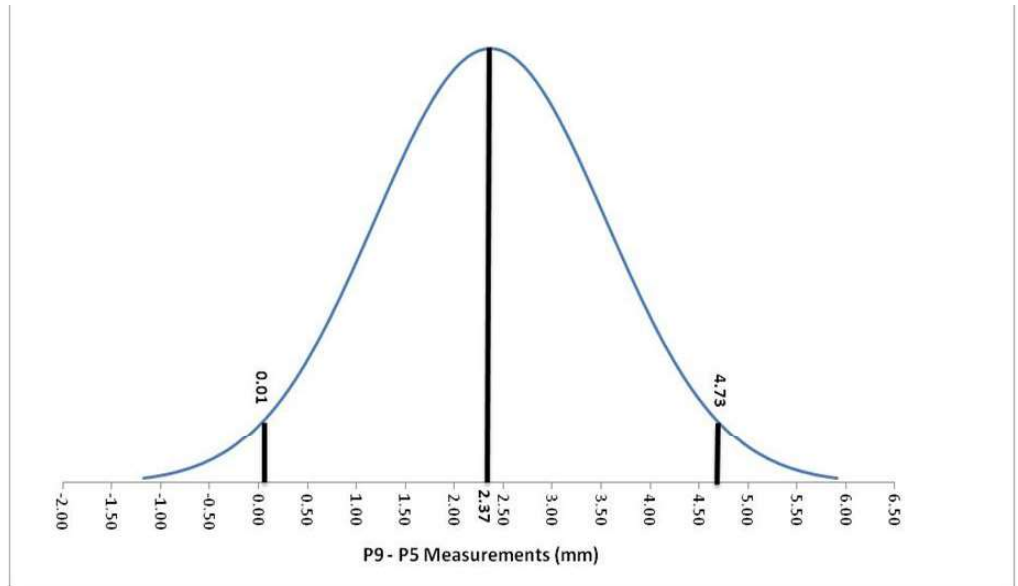


Figure 2.
 Histogram of Dusky Flycatcher P9-P5 measurements in mm.

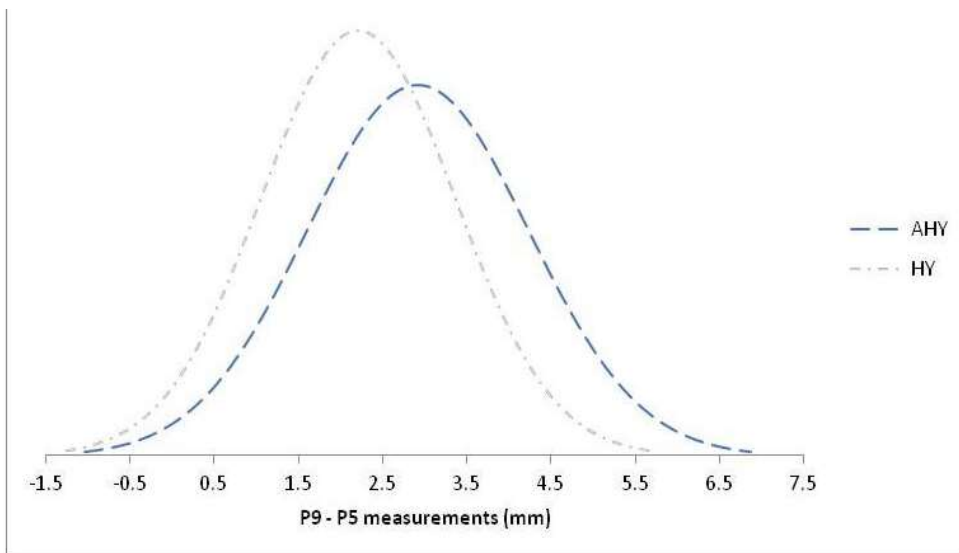


Figure 3.
 Bell curves comparing age categories (AHY vs HY) and for all bird ages combined.

DISCUSSION

Using this updated information concerning Dusky Flycatchers should help to increase the ability of banders in the southwestern United States to be able to identify this species in hand. The refined p9-p5 measurement reported here will continue to be useful in separating Dusky Flycatchers (0.0-4.8 mm) from Hammond's (5.6-11.6 mm) and Least (3.4-7.8 mm) flycatchers. These measurements should further help differentiate between other *Empidonax* species, especially during migration when there is the potential for more overlap and the number of species captured out of range is higher.

While no actual subspecies are acknowledged for Dusky Flycatchers, there have been slight geographic color variations observed between coastal (British Columbia-California) and inland (British Columbia-Arizona) breeding populations (Pereyra and Sedgwick 2020). A difference in wing-tail measurements has also been documented, with coastal birds (3.2-9.6 mm) averaging a shorter wing-tail measurement than interior birds (4.5-12.8 mm; Pyle 1997b). The differences in p9-p5 between previously documented measurements and these measurements might result from geographic variation in Dusky Flycatchers. Alternatively, the measurements in Pyle (1997a, 1997b) were largely based on collected individuals, which could be affected by the preparation of the specimens, and those from live birds in the hand may differ in various ways and be more accurate (P. Pyle, pers. comm.) The results of this study have been incorporated into Pyle (2022).

HY birds tended to trend to the lower end of the discovered range while AHY birds favored the higher end as indicated in Figure 3. This could possibly indicate that HY measurements vary slightly from AHY birds; however, the lower end of the confidence range for the 70 AHY birds captured goes down to a minimum of 0.33 mm which is well below the lower end of the initial range of 2.2 mm given in Pyle (1997b). This suggests the possibility for a difference in populations.

We hope our larger sample size of 243 birds provides more justification for identifying species and differentiating geographic variations within Dusky Flycatchers, although these measurements potentially only offer insight to the interior of the country. Further measurements may also be included in a wing morphology formula to help sex Dusky Flycatchers, as has been done with other *Empidonax* flycatchers (Pyle 1997b). Finally, this information may inspire further questions about the geographic variations that may exist for this species.

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