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Eastern Wood-Pewee Specimens from New Mexico, Plus a Reevaluation of Mensural Criteria for Identifying This Taxon

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Abstract

To my knowledge, no specimen of the Eastern Wood-Pewee (*Contopus virens*) has been reported from New Mexico, although a state occurrence was verified on the basis of a vocalizing bird recorded in Santa Fe County on 11 June 1988 (Hubbard 1988; identification confirmed by J.R. Travis). Based on that record, a few other reports of vocalizing birds, and the species' status in adjacent states (e.g., A.O.U. 1998), the Eastern Wood-Pewee (henceforth EAWP) is probably a regular, but rare migrant in New Mexico. Additional verified occurrences, however, are needed to validate this species' status in the state, including tape recordings and collections of vocalizing birds. In addition, using the mensural criteria of Phillips et al. (1966), Pyle (1997b), and as expanded in the present paper, existing New Mexico wood-pewee specimens should be reexamined to determine if EAWP's have been overlooked or misidentified as Western Wood-Pewees (*C. sordidulus*, henceforth WEWP). Toward this end, I have recently begun this process at the University of New Mexico Museum of Southwestern Biology (MSB), which has 38 study skins of this complex from the state. As a result, I have identified one specimen that is certainly an EAWP, plus another that is probably this species. In the process, I have also reevaluated, and hopefully improved, the mensural criteria by which specimens of this species can be distinguished from the closely similar WEWP.

BACKGROUND

As is well known, determining the specific identity of non-vocalizing birds of the EAWP/WEWP complex is among the most difficult challenges in bird identification in North America (Phillips et al. 1966, Rising and Scheuler 1980, Pyle 1997a,b). This is especially true in the field, but such difficulties also apply to museum specimens and birds captured for banding. Until recently, identification of wood-pewee species has been largely based on plumage and softpart characters, which will separate "typical" specimens of each reasonably well. For example, in adults that are not excessively worn, the EAWP tends to be paler, more greenish (less brownish) on the dorsum than the WEWP, with the chest patch less extensive, gray to greenish (not brownish) in color, and often lighter or even interrupted along the midline (e.g., Phillips et al. 1966, Browning 1977, Pyle 1997b). In addition, the mandible in the EAWP tends to be entirely or largely pale in color, versus more extensively dark in the WEWP. Many immatures and some adults, however, do not conform to these criteria, plus plumage characters may be affected by such factors as wear and discoloration.

Differences between these wood-pewees in most standard measurements (e.g., wing, tarsus, and culmen lengths) are slight and generally have been regarded as of limited diagnostic value, although the EAWP does average slightly smaller than the WEWP (e.g., Ridgway 1907, Browning 1977, Rising and Scheuler 1980). Phillips et al. (1966), however, found other mensural characters that reliably separate immatures of the two species, especially males and to a lesser extent females. More recently, Pyle (1997a) has reported even greater success in using these and related criteria for distinguishing both adults and immatures of these wood-pewees. For example, he was able to assign 93.8–97.5% of his specimens to species using two characters, based on a confidence interval of 95%. Spurred by these findings, I undertook the reexamination of MSB specimens. As a prelude to searching for previously unidentified EAWP's in that collection, however, I first undertook a reassessment of the mensural characters that Phillips et al. (1966) and especially Pyle (1997a) used to separate the wood-pewee species.

The mensural characters Pyle (1997a) used for distinguishing these wood-pewees are based on linear measurements of a) the tail (rectrices) and its upper coverts, and b) the remiges (primaries and secondaries) in museum skins. These tail measurements were used by Phillips et al. (1966) to generate a character referred to as "tail-clear" (cited here as Tailclear), or the distance between the tips of the longest upper tail-coverts and those of the longest rectrices. A second character was developed by Pyle (1997a), and it involves subtracting what might be termed the "wingtip" length (Wingtip) from Tailclear, to generate what I call Tailclear–Wingtip. To obtain the Wingtip, one measures the distance between the tips of the longest secondaries and those of the longest primaries in the folded wing. In their analysis of Tailclear, Phillips et al. (1966) found this character separated wood-pewee species only in immature specimens (especially males)—although I presume they analyzed it also in adults. By contrast, Pyle (1997a) found that Tailclear reliably separated both age and sex classes in the two species, to the extent that 93.8% of his sample of 80 specimens (40 of each species) was correctly identified (95% confidence interval). As for Tailclear–Wingtip, he reported an even higher level of separability for the species, amounting to 97.5% of his sample.

MATERIALS AND METHODS

To evaluate the above and related mensural characters, I used 75 sexed specimens of WEWP's and five EAWP's in the MSB collection, plus 50 of the latter species borrowed from the U.S. National Museum of Natural History (USNM). In addition, I also examined 19 unsexed WEWP specimens (MSB), although the data from these were not included in the initial statistical analyses. Also set aside among New Mexico specimens were three unknowns (MSB), the plumage/softpart characters of which suggested they might be EAWP's (see earlier discussion). Two subspecies were present among the WEWP specimens, which, in the absence of mensural differences, I combined into a single sample—as was done with the monotypic EAWP. Thus, the WEWP sample consisted of 56 sexed (plus 16 unsexed) specimens of *C. s. veliei* and 19 (plus 3) of the darker *C. s. saturatus* (for a discussion of these taxa, see Browning 1977). I measured Tailclear, Wingtip, and Tailclear–Wingtip in all specimens where possible, plus the standard measurements of wing chord (Chord) and tail length (Tail). My methods for measuring these specimens were the same as those of Pyle (1997a), although I consider mine accurate only to the nearest 0.5 mm. A straight-edged ruler was used to obtain directly all measurements except tail length, which was measured with a protractor then held against a ruler to obtain the value.

I used Corner tests to determine levels of correlation between characters, whereas means were compared using Mann–Whitney U testing (Steel and Torrie 1960). The former showed that all five of these characters (Tailclear, Wingtip, Tailclear–Wingtip, Chord, and Tail) are correlated at the P = 0.05 level, which is not surprising. Among other things, this justifies the pairing of any of the characters to generate ratios. (Some ornithological studies utilize ratios based on characters that are not correlated, which is a statistically questionable, if not invalid, practice.) In fact, I generated ratios based on a variety of pairings, and in the process discovered the useful new character of Tailclear/Tail (see below). Thus, this brought to six the number of characters that I measured and analyzed in my study. These analyses were done in two stages, the first involving comparisons of each character by sex within a species. In every case, there was sufficient divergence between the sexes that I also segregated them in the next stage of analysis, which involved the comparison of each character between the species of wood-pewees.

The above analyses were done by initially plotting and then comparing the measurements within given categories (i.e., sexes and species), such as Chord in male versus female EAWP's. This allowed me to get a feel of the variation by category and character, as well as to highlight measurements that needed rechecking. For example, I found several Tailclear measurements that were at variance with the general pattern for a category, and on rechecking found that some were invalid. In each case, this was due to the loss of the longest uppertail coverts, which produced a measurement that was greater than it should have been. In such cases, the invalid measurements were removed from my plots, and annotations made noting these specimens were unmeasurable for this character. After finalizing the plotting of character measurements, I did Corner tests (see above) to determine if significant differences existed between any categories. Finally, I calculated means, variances, and attendant information for each of the categories and characters, as summarized in Table 1.

To determine the value of the above characters in segregating wood-pewee by sex and/or species, I relied exclusively on comparisons of raw-data plots—as opposed to using statistical transformations of this information. Furthermore, I sought mensural criteria (here called diagnostic values, or DV's) that would segregate categories with a confidence interval of 100%. For example, in analyzing Tailclear in my samples, I found measurements of greater than 34 mm pertain only to EAWP's, whereas ones of less than 30 mm pertain to WEWP's. In short, my DV's for this character are > 34 mm = EAWP and < 30.0 mm = WEWP, with a reliability of 100%. As with Tailclear, I had to generate two DV's for each of the other five characters in segregating wood-pewees (by both sex and species) at this level of reliability. By contrast, Pyle (1997a) employs a single DV (which he calls a "cutoff") for each of his characters (Tailclear and Tailclear–Wingtip), by which he segregated only species (i.e., he did not deal with sexes). In addition, it should be noted that his DV's are drawn from statistical inferences rather than raw-data plots. Specifically, his DV's represent the point of intersection between the two species' means plus-or-minus two standard deviations (S.D.) for a character. Statistically, this yields an approximate confidence interval of 95%, which, theoretically, could have been expanded to 100% by increasing the variance around each mean. However, given observed variation in the characters, it is obvious that no single DV would allow 100% segregation of wood-pewee species (or sexes)—as is discussed later in this paper. In truth, Pyle's statistical approach is standard in many taxonomic studies, while mine is designed to produce the most reliable identifications of wood-pewees possible. Each approach has its limitations, an obvious one in mine being that specimens with anomalous measurements can unduly influence the generation of DV's. This in turn reduces the numbers of wood-pewee specimens that can be segregated by sex and/or species. Conversely, while more specimens will be identifiable to species under Pyle's approach, this will be at a lower confidence interval than with mine.

Of the 130 sexed specimens in my sample, all were measurable for Chord and Wingtip. By contrast, only 124 (95.4%) could be measured for Tail, 117 (90.0%) for Tailclear and Tailclear–Wingtip, and 112 (86.2%) for Tailclear/Tail. The lower totals for Tail, Tailclear, and their two derivatives (Tailclear/Tail and Tailclear–Wingtip) result mainly from feather loss, which made such specimens unmeasurable for these characters. To be considered unmeasurable, such losses had to involve the outermost or innermost rectrices or the longest uppertail coverts. Wear can also affect feather length, although this was not severe enough for me to forego this measurement in any of my specimens. Another problem I discovered was that measurements of Chord or Wingtip sometimes differ between the right and left wings of specimens. As a rule, I measured these two characters on the right wing of specimens, thus conforming to Pyle's (1997a) approach. Periodically, however, I measured both the right and left wings of given specimens, so I could assess any differences between the two. Such differences generally proved minor as regards Chord, this being on the order of 1–2 mm or < 3.0% of the overall measurement for this character. Therefore, all measurements of Chord in this paper are based on the right wing.

In contrast to Chord (above), some differences in Wingtip measurements (i.e., between right and left wings of a specimen) were more significant. In extreme cases, the differences were as much as 5 mm, which constitutes up to 13.5% of the overall measurement. Not only is this notably high, but this magnitude of difference could alter the identification of specimens (i.e., by sex and/or species)—based on whether one uses the larger or the smaller measurements. As to the source of these differences, I believe most are artifacts of specimen preparation—as opposed to representing natural variation. In fact, the majority may result from the secondaries having been "stripped" (i.e., detached from the ulna), and then drying in different positions on the two wings. As a consequence, secondaries positioned more distally would yield a greater Wingtip measurement than those more proximal. In fact, such repositioning could occur even if only the innermost secondaries had been stripped, intentionally or otherwise. Either way, this could invalidate measurements and thus lead to errors in the identification of specimens. Detecting stripped secondaries can be difficult, although it is probably more a feature of recent rather than older specimens. Whatever its source, one must be aware of this potential source of variation in Wingtip measurements, as well as others that involve them (e.g., Tailclear–Wingtip). As for resolving the problem, I have opted to do so by using the shorter Wingtip measurements where these differ between wings. This is based on the premise that shorter measurements reflect less shifting of the loosened skin (bearing the secondaries) distally along the remaining wing bone(s), thus more accurately representing the actual Wingtip. Admittedly, I have no solid proof of the validity of this premise, or even if stripping secondaries accounts for some/all differences in Wingtip measurements in wood-pewee specimens; this matter should be assessed at some point in museum specimens, including comparing such measurements within and between known preparation types.

Beyond considerations already raised above, several others bear at least a brief mention here. One is in regard to sexing museum specimens of wood-pewees, which can be especially difficult in immature and post-breeding birds. To help reduce potential mis-sexing, virtually all of the EAWP's that I used were taken in the period May–July, when gonads are at their largest (although such information was often not noted on older specimen labels!). On the other hand, my WEWP specimens were taken over a much wider period (April–October), and thus this sample may contain more mis-sexed birds. If indeed this is the case, however, it is not evident in the measurements I obtained for this species compared to the EAWP (Table 1). For example, both species show similar levels of variability within sexes, and there are similar gaps between the means of males and females. On another issue, based on the findings of Pyle (1997a) and an analysis of my own measurements, I combined adult and immature wood-pewees in samples because they are insignificantly different. Finally, as is evident from the preceding, my analysis of mensural characters is both univariant and decidedly low-tech in approach, although the DV's for characters will be discussed also in a multivariant context. While I have nothing against multivariant, computer-generated analyses (including for wood-pewees, as was done by Rising and Scheuler 1980), I favor a more utilitarian approach in identifying museum specimens and birds captured for banding. However, if anyone is interested in doing a more high-tech analysis (or otherwise using my data), please feel free to contact me about this possibility.

RESULTS

My measurements for six characters in 130 sexed wood-pewee specimens (55 EAWP's and 75 WEWP's) are summarized in Table 1. Males average larger than females in all characters, except this relationship is reversed in Tailclear–Wingtip in the WEWP. Although none of these differences is significant at the P = .05 (or greater) level, some are clear-cut and even of diagnostic value in segregating the sexes in wood-pewees (Table 2). The highest level of segregation occurs in Chord measurements, which holds in both species of wood-pewees. In the WEWP, 63.4% of the males and 52.9% of the females show no overlap in this character (60.0% in combined specimens), compared to respective percentages of 60.0, 36.0, and 49.1 in the EAWP. Separability is also high in the latter species in Tail, with 41.4% of the males, 52.0% of the females, and 46.3% of the combined specimens not overlapping. Oddly, sexual separation is much lower in this character in the WEWP, with percentages of only 16.2, 24.2, and 20.0 for the respective categories. Low levels of such separability also were found in both species in Wingtip, e.g., 21.8% in combined specimens in the EAWP and 21.3% in the WEWP. Separability in Tailclear is both low and unevenly distributed in the species, with most of the non-overlap occurring in males in the upper range of measurements (discussed below). Finally, separability based on Tailclear/Tail and Tailclear–Wingtip also is low and uneven in the two taxa.

Earlier in this paper I mentioned having also examined 19 unsexed specimens of WEWP, these identified as this species by plumage and softpart characters. Accepting these identifications as correct (also confirmed by mensural characters discussed later), I compared measurements of these specimens using the DV's (diagnostic values) in Table 2. On this basis, 18 (94.7%) of the specimens are sexable, 10 as males and eight as females. Eight of these were sexed on the basis of two characters, with five each based on one or three characters. Chord was diagnostic in 16 cases, Tail in nine, Wingtip in five, Tailclear in three, Tailclear/Tail in two, and Tailclear-Wingtip in one. When the measurements of these specimens are included with those from sexed WEWP, they require several modifications in the DV's in Table 2. For Wingtip, the value for male WEWP's increases from > 26.0 to > 27.0 mm, whereas the percentage of identifiable specimens declines from 12.2 to 9.8% (21.3 to 20.0% under combined separability). For Tailclear, the entry for female WEWP's changes from "none" to < 25.0 mm, even though no specimens are available in this category. Finally, in Tailclear/Tail, the value for males increases from > 51.3 to 52.2%, and the percentage decreases from 20.0 to 6.7 (11.1 to 4.8% for combined separability).

Table 1 also summarizes measurements for these six characters by species, and again the differences are not significant at the P = .05 level. However, as with sexes, some of the differences are useful in distinguishing specimens of the two species (Table 3). The most useful characters for separating them are Tailclear–Wingtip, Tailclear, and Tailclear/Tail, in ascending order of diagnostic value (Table 3). The percentages of separable specimens range from a low of 32.4% (Tailclear–Wingtip in the female–female WEWP vs. EAWP comparison) to a high of 84.8% (same comparison, but involving Tailclear/Tail). With two exceptions, the least diagnostic characters are Chord, Wingtip, and Tail, with non-overlapping measurements occurring in only 1.3 to 5.5% in the specimens. The first exception is Wingtip in the EAWP, in which 18.2% of the combined sample (males and females) shows no overlap with the WEWP. The second is Tail in the WEWP, in which 18.6% of the combined sample does not overlap with the EAWP. Unsexed birds also can be identified specifically in comparisons involving these six characters, as shown in Table 4. Understandably, DV's in these cases are less refined than those where the sex is known (Table 3); consequently, fewer specimens are identifiable in this situation. In fact, Chord, Wingtip, and Tail become virtually useless in identifying species among unsexed specimens, effectively leaving Tailclear, Tailclear–Wingtip, and Tailclear/Tail to serve this purpose. The latter is the best character, with 55.4% of the combined samples being identifiable to species (38.5% in each of the other two).

Although all mensural characters analyzed here can help segregate these wood-pewee species (see key in Table 5), Tailclear–Wingtip, Tailclear, and Tailclear/Tail clearly are most diagnostic for such purpose. Combining specimens of both species, I was able to correctly identify 67.2% of the males (N = 58) and 92.6% of the females (54) using the framework discussed earlier. All these specimens were measurable for the three characters, which allowed me to determine if and how these might be interrelated in given specimens. In males, I found all were diagnostic in 32.8% of the specimens, versus two in 19.0% and one in 15.4% of the others. For females, the respective figures were 25.9%, 35.2%, and 31.5%. Conversely, these three characters did not yield species identifications in 32.8% of the males and 7.4% of the females, which means other characters are necessary to identify these specimens. In the case of four male WEWP's, Tail was the diagnostic character. This probably also would reliably identify females of this species, as would Wingtip in the EAWP. For all other sexed specimens in my samples, species identification was based on plumage and softpart coloration.

As for the three New Mexico specimens (MSB) that I initially thought might be EAWP's, their particulars are as follows (including measurements of Chord, Tail, Wingtip, Tailclear, Tailclear–Wingtip, and Tailclear/Tail): no. 8693, ♂, Roosevelt Co., Boone's Draw, 15 May 1980, C.G. Schmitt (86.0, 65.0, 22.0, 36.0, 14.0 mm, 55.4%); no. 8692, ♂, Roosevelt Co., 2 miles N Milnesand, 29 September 1984, J.P. Hubbard and J.W. Eley (84.5, 67.0, 24.0, 34.0, 10.0 mm, 50.7%); no. 3298, ♀, Eddy Co., 6 miles W, 6 miles S Artesia, 9 June 1968, D.M. Niles (80.5, 58.0, 27.0, 28.0, 1.0 mm, 48.3%). As indicated earlier, these specimens resemble the EAWP in many or most features of plumage/softpart coloration, notably the olive tones dorsally; smaller and more grayish chest-patch, paler or divided along the midline; and pale lower mandible. Of the specimens, however, only the first (no. 8693) clearly keys to the EAWP—this holding true as regards Tailclear, Tailclear–Wingtip, and Tailclear/Tail (Chord, Tail, and Wingtip are in the range of overlap with the WEWP). In the second specimen (no. 8692), the measurements are all in the range of overlap between the two species; however, those for Tailclear and Tailclear–Wingtip are at the upper end of the range for the WEWP. In particular, only two WEWP specimens reach 34.0 mm in Tailclear, whereas this is just below the mean of 34.9 mm in the EAWP. On this basis and that of plumage/softpart characters, I believe this specimen is almost certainly an EAWP. Finally, the third specimen (no. 3298) clearly keys to the WEWP, based on four of its six measurements, i.e., Tail, Tailclear, Tailclear–Wingtip, and Tailclear/Tail (Chord and Wingtip fall in the range of overlap between the species). In addition, while it indeed resembles an EAWP in plumage features, these are not nearly as clear-cut as in the two above specimens. All things considered, this specimen conceivably could represent a hybrid between the species, although this is raised here more as a possibility than a suggestion.

DISCUSSION

My findings agree with those of Phillips et al. (1966) and Pyle (1997a) in that Tailclear reliably separates many specimens of the EAWP and WEWP, which also is true of the latter's findings regarding Tailclear–Wingtip. In both characters, the EAWP not only averages larger than the WEWP, but considerable non-overlap exists between the two in these features. Furthermore, as did Pyle, I found that all age classes can be separated by Tailclear measurements, not just immatures as reported by Phillips et al. (1966). In addition, I found some confirmation of the latters' findings concerning Tail as a means of separating the species, with the EAWP averaging longer than the WEWP in this character. Considerable overlap, however, occurs between them in this character, plus it is more diagnostic in males than females—as noted by Phillips et al. As a consequence, Tail is of minor value in separating these species, especially as compared to Tailclear and Tailclear–Wingtip. Finally, I found another character that separates many specimens of the two wood-pewees, this being the ratio of Tailclear to Tail, or Tailclear/Tail. In fact, this character is even better for distinguishing them than are Tailclear and/or Tailclear–Wingtip, again based on the higher average in the EAWP and the considerable lack of overlap between the species.

A notable departure between my findings and those of Pyle (1997a) concerns percentages of specimens that are specifically identifiable using Tailclear and Tailclear–Wingtip. Indeed, the same also would probably exist had he analyzed Tailclear/Tail or provided a "cutoff" point (DV) for Wingtip. (Phillips et al. 1966 did not provide comparable information, simply stating that "probably a 95 per cent separation can be made in young males [of the two species based on Tailclear and Tail measurements].") For example, Pyle found that only five specimens (6.25%) in his combined sample (N = 80) overlapped in Tailclear (using a DV of 32.5 mm), while just two (2.5%) did so as regards Tailclear–Wingtip (DV = 6.5 mm). In other words, he found that 93.8% of his specimens could be assigned correctly to species on the basis of Tailclear, and an even higher 97.5% with Tailclear–Wingtip. Using these same DV values, I found fully 20 (17.1%) of my 117 specimens overlapped in Tailclear, and an even higher 41 (35.0%) did so in Tailclear–Wingtip. Thus, my percentages of correctly identified specimens were lower for both characters, at 82.9 and 65.0%, respectively. While differences in technique or sample composition may be factors, I am at a loss to account for these levels of divergence in our findings—particularly as regards Tailclear–Wingtip. I am confident, however, that my measurements are correct, as all were made more than once at different times—particularly in the overlapping specimens.

Using Pyle's (1997a) DV values, I analyzed my samples to narrow down the sources of overlap in the above two characters. In Tailclear, I found most of the overlap (16 of 20 specimens, or 80.0%) was contributed by female EAWP's and male WEWP's, again based on a DV of 32.5 mm. More specifically, eight female EAWP's measure 32.5 mm or less, while the same number of male WEWP's is 32.5 mm or greater. Given these findings, it becomes obvious that sex needs to be taken into account when Tailclear is employed to identify wood-pewee species. As for Tailclear–Wingtip, Pyle's DV of 6.5 mm produces an overlap in my sample comprised almost entirely of male and female WEWP's (38 of 41 specimens, or 92.7%). This shows that while few of my EAWP's (three [all females] of 50, or 6.0%) have a Tailclear–Wingtip of 6.5 mm or less, fully 56.7% of the WEWP's measure 6.5 mm or more. Given this, 6.5 mm is obviously an inappropriate DV for this sample, as it leads to many WEWP's being misidentified as EAWP's. In fact, Pyle (1997b) has indicated that this DV might not be applicable to live wood-pewees, suggesting instead that the range of 8–10 mm might be better. However, even at 10 mm, nine (13.4%) of my sample of WEWP's fall in the zone of overlap with EAWP's. In addition, the number of overlapping EAWP's increases to 24 (48.0%) when the DV is set at 10 mm. This indicates that as with other mensural characters analyzed here, no single DV can reliably identify all wood-pewees to species—whether museum specimens or live birds in the hand.

As indicated earlier, one limitation of using a 100% confidence interval for wood-pewee identifications is that many specimens cannot be assigned to species (Tables 2–4). For example, in my sample of 112 sexed specimens with all six characters measurable, 17.0% cannot be assigned to species. For identifications based solely on the most reliable characters (Tailclear, Tailclear–Wingtip, and Tailclear/Tail), the unassignable portion of the sample increases to 20.5%. On the other hand, I would again emphasize that specimens identified at this confidence interval have the highest likelihood of being assigned correctly to species. Furthermore, I believe this approach also better accommodates the realities of mensural identification in these species. For example, it is obvious that some differences between the taxa are very small, and therefore drawing fine distinctions from them is clearly unwarranted. Furthermore, some characters are sufficiently difficult to measure (e.g., Tailclear and Wingtip) that differences in technique, etc., may be a significant source of bias—even to the point of producing misidentifications of species. It also should be noted that so far only small samples of wood-pewees have been analyzed, and additional material could modify findings now on record. Finally, more research is needed to determine how these findings apply to live birds, e.g., those captured for banding. Certainly, one can expect some measurements to be larger in the latter (e.g., Chord), given the shrinkage that occurs in museum skins (e.g., Winker 1993). Whatever the case, it is clear that the mensural characters used here will only reliably identify wood-pewees measured in the hand, so they should not be applied to free-flying birds in the wild!

As for confirmed records of the EAWP in New Mexico, we now have one definite and one highly probable specimen to add to the vocalizing bird that was recorded in the state in 1988 (NMOSP/TF no. 1988-86A). The latter record was unusual in two respects, one being that it was in June and the second that it was at Santa Fe, in central–northern New Mexico. By contrast, the two specimens are from the easternmost border region of the state (Roosevelt Co.) during spring (May) and autumn (September) migrations. In fact, both are the product of surveys conducted by the New Mexico Department of Game and Fish to determine the extent, composition, and timing of avian migration in that area (e.g., Hubbard 1979). Prior to those surveys, the EAWP was among the species anticipated to occur there—and now proof of this is at hand. As indicated earlier, the May record is based on a specimen (MSB no. 8693) that clearly keys to the EAWP on the basis of Tailclear, Tailclear–Wingtip, and Tailclear/Tail measurements. It also agrees with this species in plumage and softpart characters, as does the September specimen (MSB 8692). However, measurements in the latter fall within the range of overlap with the WEWP, although the specimen is closer (and probably assignable) to the EAWP based on Tailclear–Wingtip and especially Tailclear. Incidentally, if identified under the criteria of Pyle (1997a), both of these specimens would also be identified as EAWP's.

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Table 1: Measurements of Eastern and Western wood-pewees by sexes. Values in mm except Tailclear/Tail, which is expressed as a percentage (N = sample size; SD = standard deviation).

	Males				Females			
	N	Mean	SD	Range	N	Mean	SD	Range
Eastern Wood-Pewee								
Chord	30	84.2	2.1	79.5–88.0	25	79.9	1.8	75.5–83.5
Wingtip	30	24.0	2.6	20.0–28.5	25	22.1	2.8	18.0–26.5
Tail	29	65.1	1.9	62.5–70.0	25	62.0	2.1	58.5–65.0
Tailclear	29	34.9	1.9	31.0–39.0	21	32.9	1.5	30.0–35.0
Tailclear/Tail	28	53.7	2.3	48.4–57.6	21	53.2	1.6	50.8–56.4
Tailclear–Wingtip	29	10.8	2.3	7.0–15.0	21	10.6	3.0	6.0–16.0
Western Wood-Pewee								
Chord	41	85.1	2.2	81.0–91.0	34	80.7	1.4	78.5–84.0
Wingtip	41	24.4	1.7	21.5–29.0	34	22.6	2.2	18.5–26.0
Tail	37	63.6	2.3	59.5–69.0	33	61.1	2.1	57.5–65.0
Tailclear	33	30.7	1.7	27.0–34.0	34	29.4	1.4	27.0–32.5
Tailclear/Tail	30	48.5	2.6	43.8–52.8	33	48.1	2.0	42.9–51.2
Tailclear–Wingtip	33	6.5	2.5	0.5–10.5	34	6.8	2.4	1.0–11.5

Table 2: Mensural comparisons of sexes in wood-pewees, showing the diagnostic values (DV's) and percentages of specimens separable in compared samples (based on 100% confidence interval; DV values in mm, except for percentages in Tailclear/Tail). Bracketed values in the Western Wood-Pewee represent changes elicited by addition of unsexed specimens (see text).

	♂♂ versus ♀♀		♀♀ versus ♂♂		Combined
	DV	Percent	DV	Percent	Percentage
Eastern Wood-Pewee					
Chord	> 83.5	60.0	< 79.5	36.0	49.1
Wingtip	> 26.5	16.7	< 20.0	28.0	21.8
Tail	> 65.0	41.4	< 62.5	52.0	46.3
Tailclear	> 35.0	37.9	< 31.0	4.8	26.0
Tailclear/Tail	> 56.4 < 50.8	21.4	None	—	12.2
Tailclear–Wingtip	None	—	> 15.0 < 7.0	19.0	8.0
Western Wood-Pewee					
Chord	> 84.0	63.4	< 81.0	52.9	60.0
Wingtip	> 26.0 [> 27.0]	12.2 [9.8]	< 21.5	32.4	21.3 [20.0]
Tail	> 65.0	16.2	< 59.5	24.2	20.0
Tailclear	> 32.5	15.2	None [< 25.0]	—	7.5
Tailclear/Tail	> 51.3 [> 52.2]	20.0 [6.7]	< 43.8	2.9	11.1 [4.8]
Tailclear–Wingtip	< 1.0	3.0	< 10.5	5.9	4.5

Table 3: Comparisons of wood-pewee species, showing diagnostic values (DV's) and percentages of sexed specimens separable in compared samples (based on 100% confidence interval; DV values in mm, except for percentages in Tailclear/Tail).

	Eastern versus Western Wood-Pewee				
	♂♂ versus ♂♂		♀♀ versus ♀♀		Combined
	DV	Percent	DV	Percent	Percentage
Chord	< 81.0	6.7	< 76.0	4.0	5.5
Wingtip	< 21.0	20.0	> 26.5 < 18.5	16.0	18.2
Tail	> 69.0	3.4	None	—	1.9
Tailclear	> 34.0	55.2	> 32.5	61.9	58.0
Tailclear/Tail	> 52.8	60.7	> 51.3	81.0	69.4
Tailclear–Wingtip	> 10.5	55.2	> 11.5	38.1	48.0
	Western versus Eastern Wood-Pewee				
Chord	> 88.0	4.9	> 83.5	2.9	4.0
Wingtip	> 28.5	2.4	None	—	1.3
Tail	< 62.5	24.3	< 58.5	12.1	18.6
Tailclear	< 31.0	48.5	< 30.0	55.9	52.2
Tailclear/Tail	< 48.4	53.3	< 50.8	84.8	69.8
Tailclear–Wingtip	< 7.0	45.5	< 6.1	32.4	38.8

Table 4: Comparisons of wood-pewees, showing diagnostic values (DV's) and percentages of specimens (sexes ignored) separable in compared samples (based on 100% confidence interval; DV values are in mm, except for percentages in Tailclear/Tail).

	Eastern Wood-Pewee		Western Wood-Pewee		Combined
	DV	Percent	DV	Percent	Percentage
Chord	< 76.0	< 0.1	> 88.0	< 0.1	< 0.1
Wingtip	< 18.5	< 0.1	> 28.5	< 0.1	< 0.1
Tail	> 69.0	< 0.1	< 58.5	< 0.1	< 0.1
Tailclear	> 34.0	16.2	< 30.0	22.2	38.5
Tailclear/Tail	> 52.8	25.0	< 48.4	30.4	55.4
Tailclear–Wingtip	> 11.5	17.1	< 6.0	21.4	38.5

Table 5: Mensural key to study skins of the Eastern (EAWP) and Western (WEWP) wood-pewees, including by sexes (based on 130 specimens and 100% confidence interval).

A. Sex unknown .... go to couplet B

A. Sex known .... go to C

B. Tailclear/Tail > 52.8%, Tailclear–Wingtip > 11.5 mm, and/or Tailclear > 34.0 mm (of minor value are the following: Chord < 76.0 mm, Tail > 69.0 mm, and/or Wingtip < 18.5 mm) .... EAWP

B. Tailclear/Tail < 48.4%, Tailclear–Wingtip < 6.0 mm, and/or Tailclear < 30.0 mm (minor characters are: Chord > 88.0 mm, Tail < 58.5 mm, and/or Wingtip > 28.5 mm) .... WEWP

C. Specimen sexed as male .... D

C. Specimen sexed as female .... E

D. Tailclear/Tail > 52.8%, Tailclear–Wingtip > 10.5 mm, and/or Tailclear > 34.0 mm (of lesser value is Wingtip < 21.0 mm and/or of minor value are Chord < 81.0 mm and Tail > 69.0 mm) .... EAWP

D. Tailclear/Tail < 48.4%, Tailclear–Wingtip < 7.0 mm, and/or Tailclear < 31.0 mm (of lesser value is Tail < 62.5 mm and/or of minor value are Chord > 88.0 mm and Wingtip > 28.5 mm) .... WEWP

E. Tailclear/Tail > 51.3%, Tailclear > 32.5 mm, and/or Tailclear–Wingtip > 11.5 mm (of lesser value is Wingtip < 18.5 mm and/or of minor value Chord < 76.0 mm) .... EAWP

E. Tailclear/Tail < 50.8%, Tailclear < 30.0 mm, and/or Tailclear–Wingtip < 6.1 mm (of minor value is Tail < 58.5 mm and/or Chord > 83.5 mm) .... WEWP

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