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RESPONSE

Wang Yong[1] and Deborah M. Finch[1,2]

Hubbard (1999) criticizes our paper *Migration of the Willow Flycatcher along the middle Rio Grande* (Yong and Finch 1997), where we reported aspects of stopover ecology of the species including timing, abundance, fat stores, stopover length, and habitat use. Hubbard questions our identification of subspecies of the Willow Flycatcher (*Empidonax traillii*) and the methods we used to identify them. He also attempts to evaluate the accuracy of our results of subspecies composition by comparing them with data from other researchers. We welcome and applaud this scrutiny in the hope that this interchange will stimulate greater interest, research, and capability to distinguish the phenotypic characteristics of subspecies of the Willow Flycatcher. Given that the southwestern race (*E. t. extimus*) of the Willow Flycatcher is federally listed as Endangered, reliable methods for identifying this subspecies need to be developed to more effectively conserve and recover its populations.

We are aware that the subspecific taxonomy of the Willow Flycatcher is inconsistent among taxonomists as are the techniques to identify subspecies. Consequently, reliable identification of subspecies is difficult, especially in field situations. We acknowledge that issues of taxonomic status, population distributions, and identification methods of subspecies of the Willow Flycatcher should be explored further. However, Hubbard's criticisms of our paper are generally based on erroneous information as well as incorrect assumptions about our methods, and they do not alter our conclusions about Willow Flycatcher stopover ecology at the species level.

Hubbard's first criticism focuses on the methods we used for identifying the subspecies. Rather than using an assemblage of subspecies skins as advocated by Hubbard to identify Willow Flycatcher subspecies in the field, we relied on descriptions and records of coloration and morphology published in the available literature by taxonomists. Contrary to what Hubbard speculates, we did not convert color descriptions into Smithe's (1975) color code values. We based our identification of back plumage color on the most recent research by Unitt (1987) and Browning (1993). Using Smithe's color codes to describe back plumage, Unitt (1987) writes: "In *brewsteri* the green is in the direction of olive green (color 48), in *adastus* in the direction of greenish olive (color 49), and in *extimus* and *traillii* in the direction of grayish olive (color 43). That is, *brewsteri* is a dark brownish olive, *adastus* a dark grayish green, and *extimus* and *traillii* a pale grayish green. . ." Browning (1993) suggested that Smithe's color system is problematical because the color swatches generally are not identical matches for actual colors. Hence, he used Munsell Color Charts (1990) to describe the crown and back contrast for his specimens. During our fieldwork, we consulted both Unitt's (1987) color codes for subspecies' back color and Browning's color contrast scores between crown and back. Although Hubbard suggests that live specimens have some disadvantages, we counter that the plumage coloration of live birds is more likely to be true to type than skin specimen plumage that may have faded. If our hypothesis that the coloration of fresh plumage differs from that of faded plumage is correct, then data collected from live specimens may be more reliable, or at least not less reliable, than results obtained from study skins. Birds occasionally called or sang in our study after being released. Information about song and call characteristics were also recorded when possible. Such data are available from living flycatchers but not from skins. Sedgewick's (pers. comm.) preliminary analyses of Willow Flycatcher song and call signatures collected

[1] USDA Forest Service, Rocky Mountain Forest Research Station, 2205 Columbia, SE, Albuquerque, NM 87106.

[2] Corresponding author; E-mail: Finch_Deborah_M/rmrs_albq@fs.fed.us

in different regions suggest that *E. t. extimus* song structure can be distinguished from that of its northern conspecifics and we used this kind of data to aid identification also.

We did not rely solely on coloration for subspecies identification, contrary to Hubbard's second assumption. Unitt (1987) suggested that wing formula (relative length of primary feather length) can be used to assist subspecies identification. Of the 305 specimens that Unitt (1987) examined, wing formula distinguished 93% of the *E. t. extimus* and *E. t. traillii,* 88% of the *E. t. adastus* and *E. t. traillii,* and 89% of the *E. t. brewsteri* and *E. t. traillii.* Browning (1993) also applied wing formula to assess variation in subspecific characteristics, and his results also demonstrated that wing formula may be useful for distinguishing some subspecies although his sample size was smaller than Unitt's. Hubbard himself (1987) noted that *E. t. brewsteri* was smaller than other described forms. In the field, we relied partly on non-overlapping extreme wing measurements to assist in the identification of this subspecies. In addition, we measured and recorded more than 30 variables from each individual. Following Unitt (1987), we used wing formula to aid in identifying subspecies.

Thirdly, Hubbard (1999) comments that "even when characteristics of populations are better known, opinions may differ as regards their taxonomic treatment" because of limited sample sizes, interbreeding among populations, and differences in taxonomists' methods, views, and findings. Although we agree that taxonomists have been inconsistent in their treatment of subspecific taxonomy, we consider this to be an incentive for finding areas of common ground among researchers, rather than a justification for concluding that reliable identification of subspecies is impossible. Hubbard states that we should have strictly adhered to a single view of subspecies taxonomy. We followed a single view of subspecies treatment, but we did not credit this single view to a single researcher. We made it clear that we adopted the "four subspecies classification system of Hubbard (1987) and Unitt (1987)." We warned readers in our Methods section that: "Given morphological overlap and hybridization among subspecies, complete accuracy in identifying subspecies is not achievable." Although taxonomists disagree in their interpretations of within-species variation and subspecies recognition, there is unmistakable agreement about use of a four subspecies classification among recent research papers (Hubbard 1987, Unitt 1987, Browning 1993). Hubbard (1987) clearly advocates acceptance of the four subspecies classification in his report by stating that: "Given the degree of agreement among recent workers, I believe the most prudent course is to accept all of the above subspecies [i.e., *E. t. extimus, brewsteri,* and *adastus*] and *traillii* as valid—at least until more definitive studies are available." Although in his commentary Hubbard declares his own report to be a "cobbling job", its quality is deemed sound by other authorities. Indeed, it has been widely distributed and cited both unofficially and officially by the Endangered Species Programs of U.S. Fish and Wildlife Service regions, by state Game and Fish Departments, and by other agencies and ornithologists in the western United States, especially in the Southwest. Given Hubbard's background as a competent taxonomist in New Mexico and as an officer of the state endangered species branch, his paper is judged as an authoritative source on the species. For example, in the process used for listing the southwestern Willow Flycatcher as a federally endangered subspecies, Hubbard's paper was one of the most heavily cited reports by the U.S. Fish and Wildlife Service (1995).

Unitt (1987) also states that the four races of *E. traillii* are valid and may be distinguished from each other by "color, wing formula, or both". Browning (1993) further separated subspecies *E. t. traillii* into two populations: *E. t. campestris* of the Great Plains and Great Lakes regions, and *E. t. traillii* to the southeast of *E. t. campestris.* We recently became aware, that Unitt has conducted further research on the same specimens and may soon be updating his taxonomic treatment (P. Unitt, pers. com. through J. E. Cartron). These different authors describe subspecies distributions that are very similar although population boundaries are not exactly the same. U.S. Fish and Wildlife Service relied partly on these studies to conclude that listing the southwestern Willow Flycatcher as an endangered subspecies was appropriate.

Fourthly, Hubbard evaluates our results by

comparing our subspecies composition data with subspecies data from his own and other reports and sources. While such comparisons may be valid for the purpose of exploring potential sources of variation, the conclusions that Hubbard draws are incorrect because of spatial and temporal differences among studies. Species, subspecies, and population composition of migratory birds captured at specific stopover sites in fall or spring can dramatically differ from what is observed at the same location during the breeding season at the same location or from other locations during migration. For example, the overall species composition we detected indicated that the majority of individuals captured were not local breeders and many did not even breed in New Mexico (Finch and Yong 1999). While we used a standardized, systematic procedure to sample throughout the entire migration seasons of spring and fall, 1994 and 1995, other studies that Hubbard (1999) cites and compares to ours were not conducted during migration seasons and/or did not use standardized procedures. In addition, source studies cited by Hubbard are heterogeneous in relation to study goals, year of study, number of years, geographical location, sampling design, sampling season, and quality of data, leading to uncontrolled and unknown factors that invalidate comparisons with our data set. Our data are restricted to two sites during two years in the middle Rio Grande valley of New Mexico, and thus are only truly comparable to other data from the same vicinity, year, and sampling design. Given that different studies, especially earlier ones, used controversial criteria for classifying and counting their specimens, Hubbard's argument that our results are inaccurate because they are not completely consistent with other studies that, when compared, also yielded dissimilar results is circular. In our manuscript, we did not make such comparisons for at least two reasons: (1) our research focus was on the stopover biology of the species, not on the taxonomic status of the subspecies, and (2) other data sources were not homogeneous or similar enough to draw comparisons.

Our data and conclusions about the flycatcher's stopover ecology are not dependent on the validity or accuracy of its subspecies status or on the methods used to identify subspecies. Because *E. t. extimus* is endangered, U.S. Fish and Wildlife permits for collecting voucher specimens during migration are not issued in the Southwest, eliminating the possibility of having an alpha-taxonomist identify locally caught specimens to subspecies for the purpose of setting standards. Because most current research studies and conservation efforts pertaining to the Willow Flycatcher have focused on its breeding grounds, the importance of our research centers on when, where, and how migration stopover sites in riparian woodlands along the middle Rio Grande are used for resting and fat depositions by the species. Without understanding the migration strategy of the species and without justifying efforts to conserve the stopover habitat that the species uses, the Willow Flycatcher's fate in the Southwest will be jeopardized regardless of how perfect or imperfect our ability in identifying subspecies is.

Throughout ornithological history, subspecies classification and identification have traditionally been a "problematic" area, particularly within the genus *Empidonax*. Uncertainties about subspecies or even species status do not negate the value of our migration research or refute our results about Willow Flycatcher stopover ecology or intraspecific variation in migration patterns. We assert that increased knowledge of the stopover behavior and energetic condition of the Willow Flycatcher is important for understanding the biology of the species as a whole and that information about within-species variation is valuable in conserving the endangered southwestern subspecies.

Our paper and Hubbard's (1999) critique have opened up the opportunity to develop and expand discussion and evaluation of the different subspecies, the subspecies concept as a whole, and whether subspecies should be recognized for the Willow Flycatcher given the disagreement about their identification and the difficulty in identifying birds in hand. We invite and challenge others to contribute ideas and knowledge to this controversy in the hope that new or better techniques for identifying willow flycatcher subspecies may result. Such discussion or results would certify beyond a doubt the worthwhile contribution of our paper. Subjecting any paper to a critical commentary, however, automatically attracts the

notice of additional readers. We are pleased with the extra attention in the hope that further research, understanding, and conservation efforts will be directed toward the endangered southwestern Willow Flycatcher and its disappearing habitat.

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