

Condition of Wings is an Important Criterion of Bat Health: A Response to Francl et al.

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Damaged wing membranes of bats were recently investigated by Francl et al. (2011) for several species in the eastern United States that are potentially affected by white-nose syndrome (WNS). We commend their efforts, but dispute their assumptions, analyses, and conclusions.

Wing damage is not used to confirm WNS: In response to elevated prevalence of wing damage in bats near WNS-affected hibernacula in 2008, we proposed a wing damage index (WDI) to objectively monitor wing conditions of bats in the field (Reichard and Kunz, 2009). Francl et al. suggested WDI is used “...as a proxy for measuring population-level infection” with WNS (Francl et al., 2011), but wing damage is only one field sign associated with WNS and does not confirm WNS-positive bats. Instead, WNS is diagnosed by histopathologic confirmation of cutaneous infections attributed to a recently introduced fungus, *Geomyces destructans* (Meteyer et al., 2009; USGS, 2011). Thus, we argue that suggesting use of WDI as a proxy for infection is inappropriate and misleading.

Not all “cave bats” are alike: For assessing correlations between WDI and other variables, Francl et al. categorized several species into one group called “cave bats.” Although this category is technically accurate, it is not biologically justified in this study. There is noteworthy variation among bat species in the numbers of confirmed cases of WNS. In particular, big brown bats (*Eptesicus fuscus*), which comprise >50% of “cave bats” measured by Francl et al., are confirmed WNS-positive notably less frequently than other species (A. Ballmann,

pers. comm.). Their large sample of big brown bats might have diluted statistical trends in WDI over time or space in consideration of WNS-associated wing damage. Furthermore, to our knowledge, Francl et al. did not account for at least two factors affecting body mass index (BMI)—bats are significantly heavier while pregnant or with full stomachs (e.g., Anthony and Kunz, 1977). Accordingly, we recommend that comparisons of WDI be made intraspecifically and urge caution in drawing conclusions from BMI data presented by Francl et al. (2011).

WDI is an important criterion of bat health: Francl et al. concluded that “the lack of statistical relationships between BMI and WDI ... indicates [that] WDI is unsuitable for assessing overall bat health,” thus implying that WDI could replace other metrics for bat health, which would be an overreach of this single field-based statistic. Notwithstanding, high-WDI near WNS-affected hibernacula has been documented (Reichard and Kunz, 2009; Francl et al., 2011) and epidermal lesions might play an important role in the progression of WNS (Cryan et al., 2010). Because WDI does not require specific knowledge of causes or timing of injuries, it can inform important questions about bat biology, including those Francl et al. (p. 42) inaccurately claimed complicate its use. Thus, we assert that WDI is an important criterion of bat health and its continued use in the field is warranted and encouraged.

LITERATURE CITED

ANTHONY, E. L. P., AND T. H. KUNZ. 1977. Feeding strategies of the little brown bat, *Myotis*