

FEATURE ARTICLES

THE ALLOMETRIC RELATIONSHIP BETWEEN RESTING METABOLIC RATE AND BODY MASS IN WILD WATERFOWL (ANATIDAE) AND AN APPLICATION TO ESTIMATION OF WINTER HABITAT REQUIREMENTS

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Abstract. We examined the allometric relationship between resting metabolic rate (RMR; kJ day^{-1}) and body mass (kg) in wild waterfowl (Anatidae) by regressing RMR on body mass using species means from data obtained from published literature (18 sources, 54 measurements, 24 species; all data from captive birds). There was no significant difference among measurements from the rest (night; $n = 37$), active (day; $n = 14$), and unspecified ($n = 3$) phases of the daily cycle ($P > 0.10$), and we pooled these measurements for analysis. The resulting power function ($a\text{Mass}^b$) for all waterfowl (swans, geese, and ducks) had an exponent (b ; slope of the regression) of 0.74, indistinguishable from that determined with commonly used general equations for nonpasserine birds (0.72–0.73). In contrast, the mass proportionality coefficient (b ; y-intercept at mass = 1 kg) of 422 exceeded that obtained from the nonpasserine equations by 29%–37%. Analyses using independent contrasts corrected for phylogeny did not substantially alter the equation. Our results suggest the waterfowl equation provides a more appropriate estimate of RMR for bioenergetics analyses of waterfowl than do the general nonpasserine equations. When adjusted with a multiple to account for energy costs of free living, the waterfowl equation better estimates daily energy expenditure. Using this equation, we estimated that the extent of wetland habitat required to support wintering waterfowl populations could be 37%–50% higher than previously predicted using general nonpasserine equations.

Key words: allometry, Anatidae, bioenergetics models, body mass, habitat requirements, resting metabolism, waterfowl.