

**SPECIAL SECTION: HIERARCHICAL MODELS IN AVIAN ECOLOGY**

**A VARIANCE-DECOMPOSITION APPROACH TO INVESTIGATING MULTISCALE HABITAT ASSOCIATIONS**

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*Abstract.* The recognition of the importance of spatial scale in ecology has led many researchers to take multiscale approaches to studying habitat associations. However, few of the studies that investigate habitat associations at multiple spatial scales have considered the potential effects of cross-scale correlations in measured habitat variables. When cross-scale correlations in such studies are strong, conclusions drawn about the relative strength of habitat associations at different spatial scales may be inaccurate. Here we adapt and demonstrate an analytical technique based on variance decomposition for quantifying the influence of cross-scale correlations on multiscale habitat associations. We used the technique to quantify the variation in nest-site locations of Red-naped Sapsuckers (*Sphyrapicus nuchalis*) and Northern Flickers (*Colaptes auratus*) associated with habitat descriptors at three spatial scales. We demonstrate how the method can be used to identify components of variation that are associated only with factors at a single spatial scale as well as shared components of variation that represent cross-scale correlations. Despite the fact that no explanatory variables in our models were highly correlated ( $r < 0.60$ ), we found that shared components of variation reflecting cross-scale correlations accounted for roughly half of the deviance explained by the models. These results highlight the importance of both conducting habitat analyses at multiple spatial scales and of quantifying the effects of cross-scale correlations in such analyses. Given the limits of conventional analytical techniques, we recommend alternative methods, such as the variance-decomposition technique demonstrated here, for analyzing habitat associations at multiple spatial scales.

*Key words:* habitat selection, logistic regression, multicollinearity, nest site, scale, statistical analysis, variance decomposition.