

## **The Design of Artificial Nestboxes for the Study of Secondary hole-nesting Birds: A Review of Methodological Inconsistencies and Potential Biases<sup>1</sup>**

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### **ABSTRACT**

The widespread use of artificial nestboxes has led to significant advances in our knowledge of the ecology, behaviour, and physiology of cavity nesting birds, especially small passerines. Nestboxes have made it easier to perform routine monitoring and experimental manipulation of eggs or nestlings, and also repeatedly capture, identify and manipulate the parents. However, the use of nestboxes may also introduce an unconsidered and potentially significant confounding variable due to differences in nestbox design amongst studies, such as their physical dimensions, placement height, and the way in which they are constructed and maintained. Here we review to what extent the characteristics of artificial nestboxes (e.g. size, shape, construction material, colour) are documented in the ‘methods’ sections of publications involving hole-nesting passerine birds using natural or excavated cavities or artificial nestboxes for reproduction and roosting. Despite explicit previous recommendations that authors describe in detail the characteristics of the nestboxes used, we found that the description of nestbox characteristics in most recent publications remains poor and insufficient. We therefore list the types of descriptive data that should be included in the methods sections of relevant manuscripts and justify this by discussing how variation in nestbox characteristics can affect or confound conclusions from nestbox studies. We also propose several recommendations to improve the reliability and usefulness of research based on long-term studies of any secondary hole-nesting species using artificial nestboxes for breeding or roosting.

**Keywords :** *Methods, Nestboxes, Nest sites, Passerines, Secondary cavity-nesting birds, Field experiments, Tit, Flycatcher, Ficedula, Parus, Cyanistes*

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