

Male Birds or Female Birds? Sex Determination Based on Visible Gender Differences as well as Molecular Methods in Blue tits

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1. Introduction

Gender identification in certain bird species is not always reliable in terms of accuracy, even if the species is sexually dimorphic [1]. An accurate knowledge of the proportion of sexes has great significance in research projects, thus, in undertakings with the aim of preserving nature. The purpose of my research is to develop a new method for accurately identifying characteristic gender traits and deciding whether it is possible to find such traits in the first place. I chose blue tit (*Cyanistes caeruleus*) as the tested species of my research because it is relatively easy to capture throughout the year.

2. Research Methods

I analysed huge quantities of biometric data. In addition to the gender putatively determined during field work. The biometric parameters of the birds which were collected during the field work – were analysed by different statistical methods (e.g. *T*-test). In order to confirm the model, I contrasted the predictions of the model with actual DNA data to verify whether the model has any predictive value.

3. Results

I analysed the data collected by seven bird ringing experts. During the Independent-Samples *T*-test, a significant difference was found between the male and female birds for every biometric parameter [2].

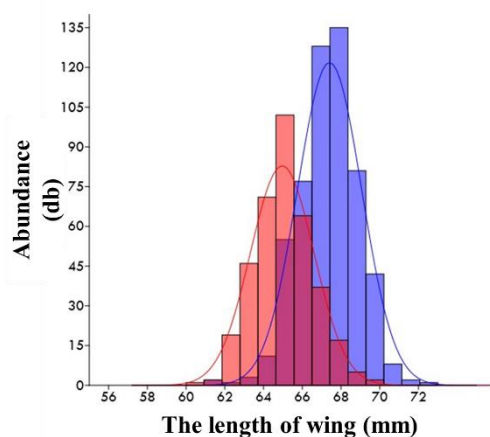


Figure 1 – Results of *T*-test on the length of wing

Yet, displaying the data on a histogram produced many overlaps. (Figure 1) Through linear discriminant analysis, I did not find distinct groups. Therefore, during the statistical analysis, it turned out that biometric data is not sufficient in itself for identifying the sex of a blue tit. In my original model, I found that a bird with a feather length of over 68 mm is male, while one with wing length of under 64 mm is female. When my model was confirmed by DNA data, my model proved to be invalid as I found birds with a wing length of 70–72 mm to be female. Furthermore, it turned out that I identified the gender of 10 out of 92 birds incorrectly during field work. (Table 1) In the confusion matrix of the resulting linear discriminant analysis [3], the apriori and the biometric data groups showed the least similarity.

Table 1 – Gender identification of 92 blue tits based on body traits and CHD-1 gene (*N* is the number of sample)

	N	♂♂	♀♀	precarious
Field identification	92	48	25	19
Gender based on DNA		45	47	14

4. Conclusion

In conclusion, using biometric data for gender identification is inaccurate and my statistical model built on this foundation was tested against actual DNA data and found to be inaccurate. In the future, I intend to apply my methodology to endangered species as well, such as European bee-eater.

5. References

- [1] Demongin, L. (2016): Identification Guide to Birds in the Hand. *Beauregard-Vendon*
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- [3] Hámori G. (2014): Predikciós célú klasszifikáló statisztikai modellek gyakorlati kérdései. (PhD Thesis.) *Doctoral (PhD) School for Management and Organizational Science, University of Kaposvár.*