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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. An accurate knowledge of the proportion of sexes has great significance in research and conservation projects 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 the blue tit (*Cyanistes caeruleus*) as the target species of my research because it is relatively easy to capture throughout the year [1].

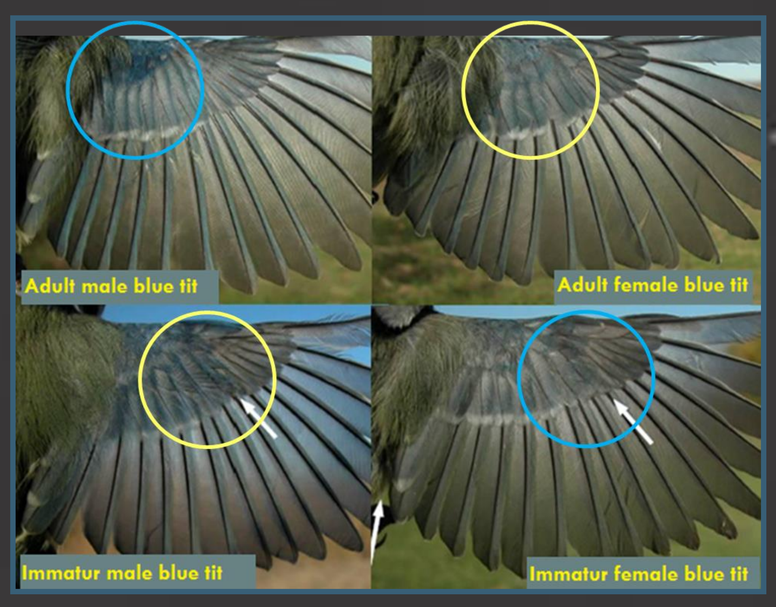
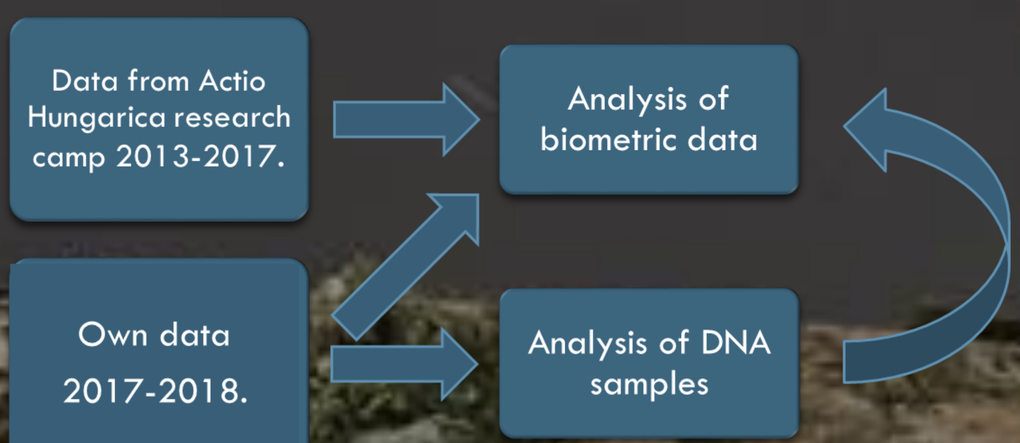


Figure-1. Field gender identification, color differences between coverts

2. 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 [2, 3].



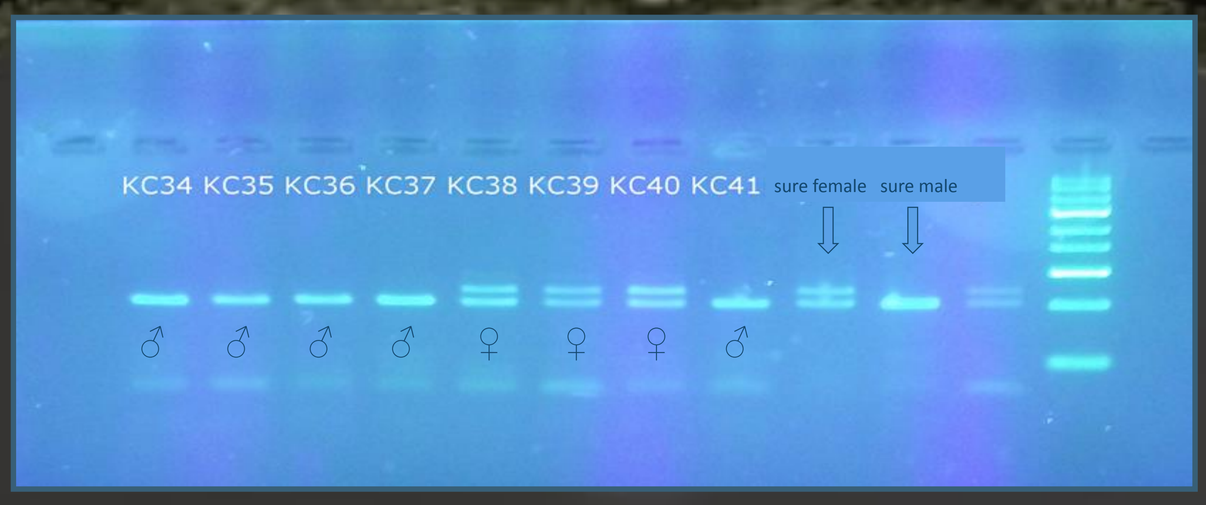


Figure-2. DNA Gender identification, result of gel electrophoresis

3. Results

I analysed the data collected by seven bird ringing experts. During the Independent-Samples *T*-test, significant differences were found between the male and female birds for every biometric parameters Yet, displaying the data on a histogram produced many overlaps. (*Figure-3*) 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. 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. (*Figure 2*) In the confusion matrix of the resulting linear discriminant analysis [2], the a priori and the biometric data groups showed the least similarity.

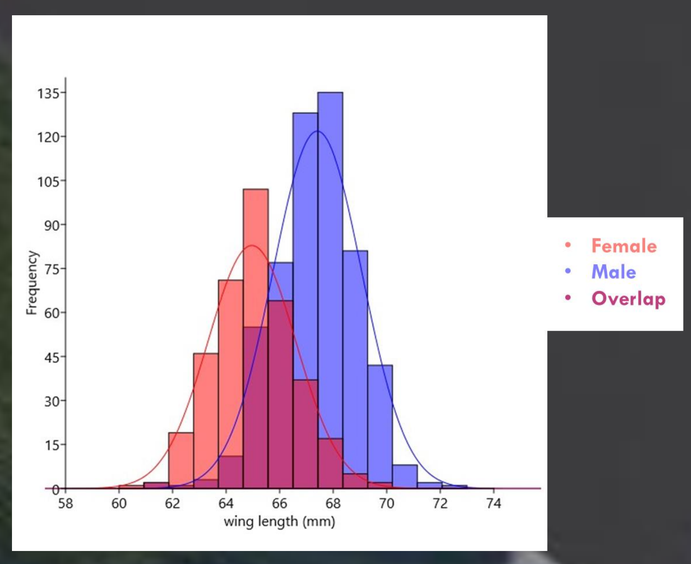


Figure-3. Dispersion of wing lengths

Table-1. Gender identification of 92 blue tits based on body traits and CHD-1 gene

	N	♂♂	♀♀	precarious
Field identification	92	48	25	19
Gender based on DNA		45 (5)	47 (14)	

4. Conclusion

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


Scops owl (*Otus scops*)


European bee-eater (*Merops apiaster*)

References

[1] Demongin, L. (2016): Identification Guide to Birds in the Hand. *Beauregard-Vendon*

[2] Précsényi I. (1995): Alapvető kutatástervezési, statisztikai és projektéértékelési módszerek a szupraindividuális biológiában. *Department of Evolutionary Zoology and Human Biology, University of Debrecen.*

[3] Blackwell Science Ltd (1998): A DNA test to sex most birds, Molecular Ecology, 7, 1071–1075