

Pitted Against the Odds: Do PIT Tags Affect Black-Capped Chickadee (*Poecile atricapillus*) Survival or Body Condition?

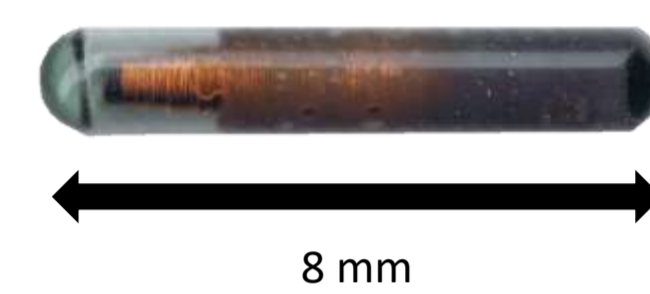
Jonathan Farr¹, Elène Haave-Audet¹, Dr. Kimberley Mathot^{1,2}

¹) Department of Biological Sciences, University of Alberta, Edmonton, AB Canada. For questions, contact jfarr@ualberta.ca
²) Canada Research Chair in Integrative Ecology



Background

PIT (Passive Integrated Transponder) tags are microchips used with RFID (Radio Frequency Identification) devices placed at discreet locations (feeders) to detect individual visits. PIT tags auto-record foraging to help study chickadee behavior.



8 mm



8 7 8 9 6 5 6 6 9 4 6 6 3



Two PIT attachment methods in birds: (a) Leg bands with PIT tags embedded and (b) subcutaneous implants.



PIT tags have no detectable impact on the survival or body condition of several small passerine birds^{1,2,3}.

Leg band PIT tags cause leg deformities in some chickadees (Morand-Ferron, personal communication), but are being widely used on chickadees across North America^{4,5}.

Question

Do PIT tags affect Black-capped Chickadee survival or body condition?

Field Methods



(a) Study Area: University of Alberta Botanical Gardens, feeder locations

(b) Capture Method: Mist netting

(c) Processing: Canadian Wildlife Service ID band, body measurements, behavioural assays, 1 of 3 preassigned PIT treatments: Control (no tag, n=74), Leg Band (n=77), Implant (n=73)



Survival Analysis

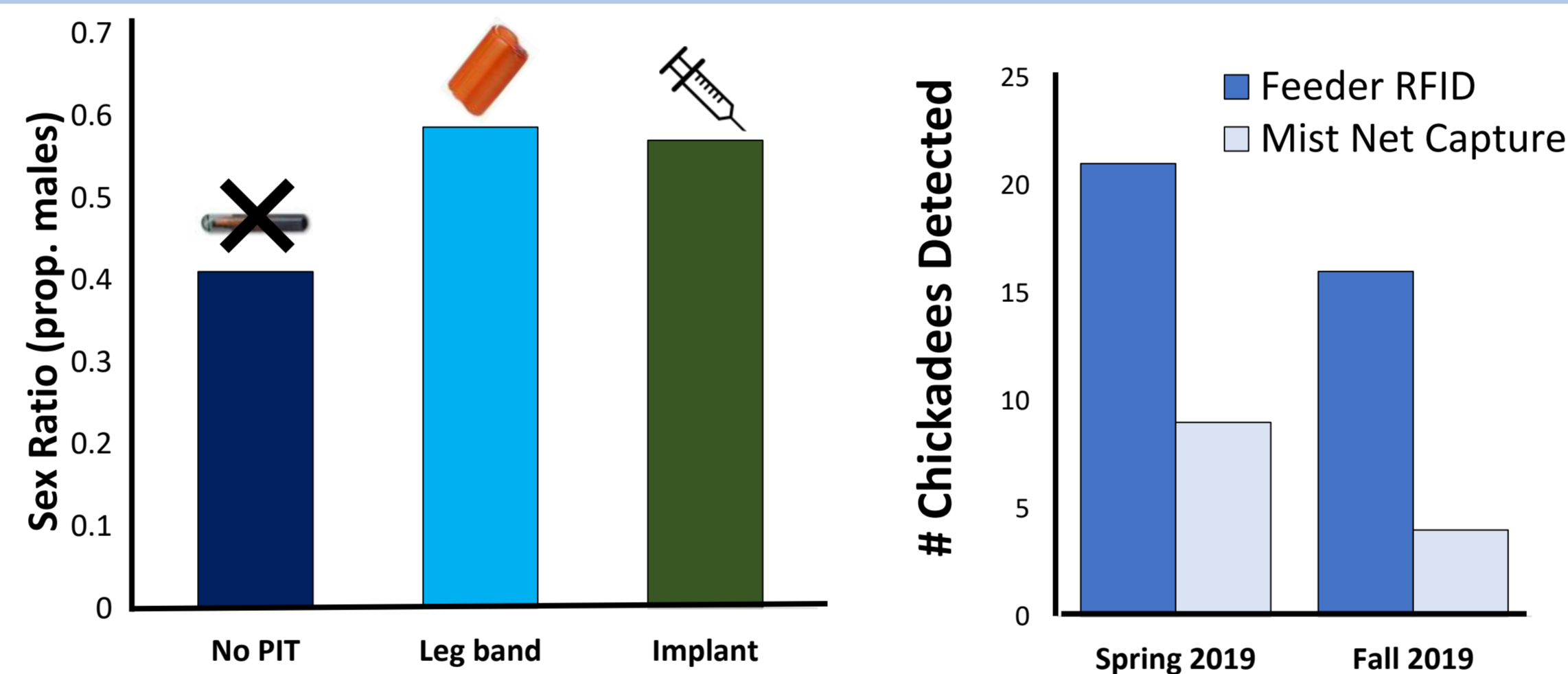


Figure 1. Sex ratios differed across PIT treatments, and therefore sex was carefully considered in all analyses, because male chickadees are reported to have higher survival than females⁶.

Figure 2. RFID feeder detections show that many surviving birds are not recaptured. Only leg band PIT tags could be reliably detected at feeders.

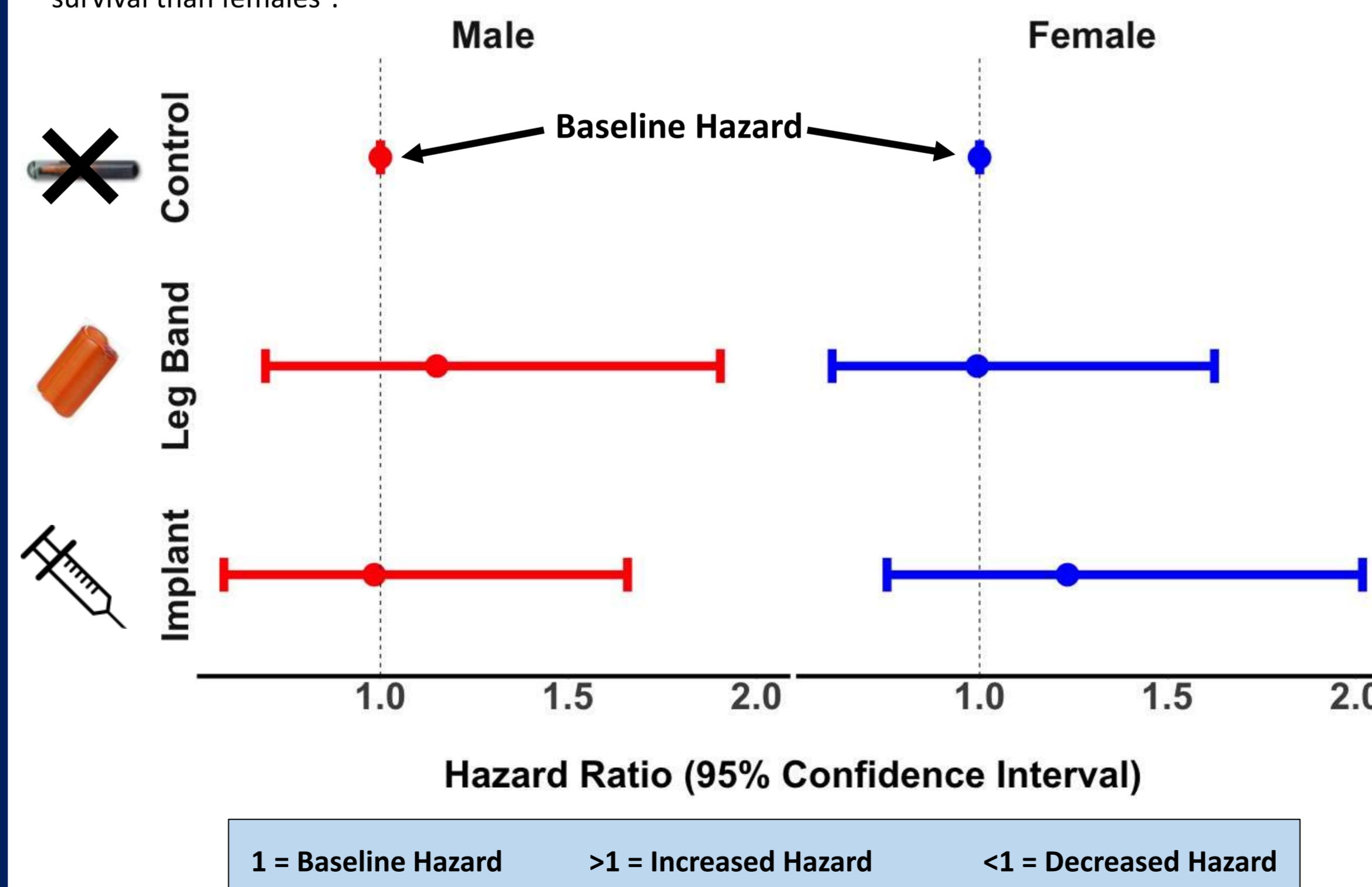
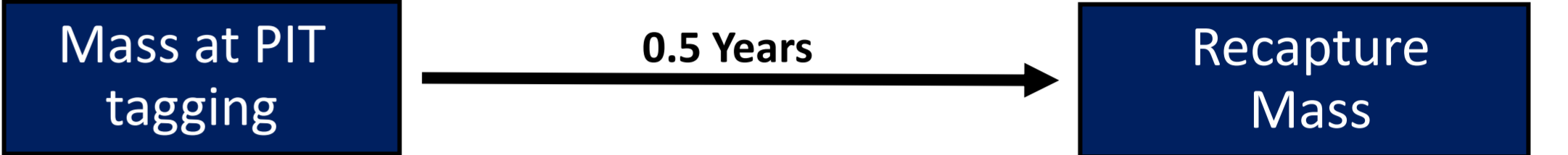


Figure 3. Hazard ratios generated from two separate cox proportional hazards models examining the effect of PIT tag treatment on the survival of male and female Black-capped Chickadees. Hazard ratios are interpreted by comparing them to an arbitrary baseline hazard treatment (=1); values greater than 1 indicate reduced survival and values less than 1 indicate higher survival. Error bars represent the 95% confidence intervals of the hazard ratios.

Body Condition Analysis



A generalized linear model was used to determine if there were significant differences in the mass of chickadees of the three treatments, 0.5 years after being PIT tagged.

Recapture Mass ~ PIT Treatment + Mass at PIT tagging + Sex + Catching Season

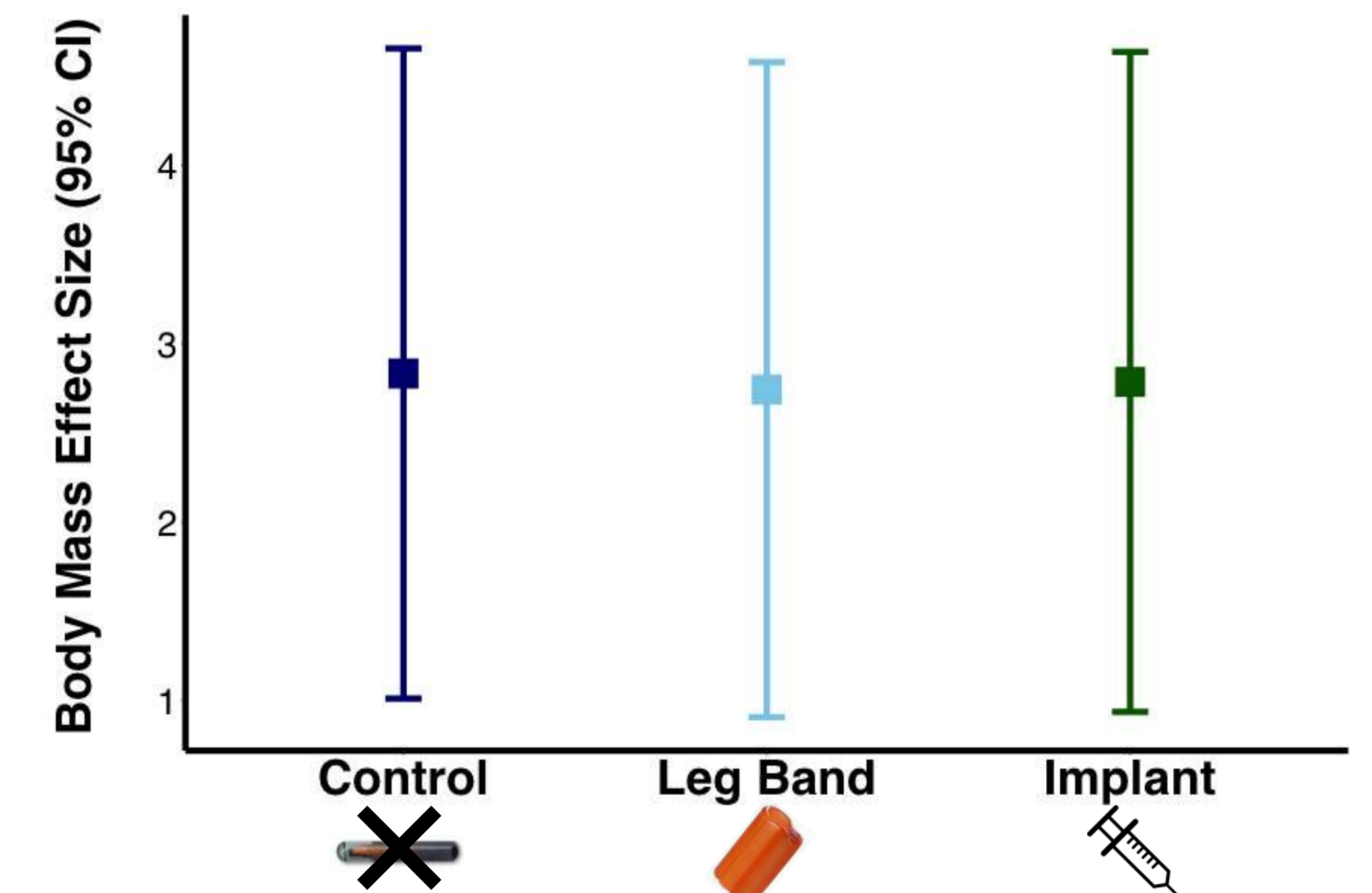


Figure 4. Effect sizes (model intercepts) of a multiple linear regression model examining differences in the recapture mass of chickadees across PIT treatments. No PIT treatment and female were the reference levels, and the mass at first capture and capture season were included as covariates. The model explained most of the variance in the data ($R^2=0.7597$). Error bars represent the 95% confidence intervals of the model estimates.

Conclusions

PIT tags have no detectable effects on Black-capped chickadee survival or body condition. Leg bands are preferable due to higher retention and RFID detection and are the best tagging method for the Mathot Lab Chickadee Project.

Acknowledgements and Literature Cited

The data for this project was collected and recorded by members of the Mathot lab. I would like to thank Dr. Kimberley Mathot and Elène Haave-Audet for their mentorship in this project, as well as all members of the Mathot lab for their support throughout this learning experience

- NICOLAUS, M., K. M. BOUWMAN AND N. J. DINGEMANSE. 2008. Effect of PIT tags on the survival and recruitment of Great Tits *Parus major*. *Ardea*, 96: 286-292.
- SCHROEDER, J., I. R. CLEARY, S. NAKAGAWA, N. OCKENDON AND T. BURKE. 2011. No evidence for adverse effects on fitness of fitting passive integrated transponders (PITs) in wild house sparrows *Passer domesticus*. *Journal of Avian Biology*, 42: 273-275.
- RATNAVALE, C. P., C. MORGENTHAU, S. RUUSKANEN, A. VILLERS AND R. L. THOMSON. 2014. Passive Integrated Transponders (PIT) on a small migratory passerine bird: absence of deleterious short and long-term effects. *Ornis Fennica*, 91: 244-255.
- EVANS, J. C., I. DEVOST, T. B. JONES AND J. MORAND-FERRON. 2018. Inferring dominance interactions from automatically recorded temporal data. *Ethology*, 124: 188-195.
- BALBY, J. M., M. W. REUDINK, S. E. LAZARUS, M. PATRICK, C. J. JOHNSON, D. J. HILL AND K. A. OTTER. 2018. Using radio frequency identification (RFID) to investigate the gap-crossing decisions of Black-capped Chickadees (*Poecile atricapillus*). *Auk*, 135: 449-460.
- DESROCHERS, A., S. J. HANMON AND K. E. NORDIN. 1988. Winter survival and territory acquisition in a northern population of Black-capped Chickadees. *Auk*, 105: 727-736.
- R Core Team (2013). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <http://www.R-project.org/>.