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# Novelty responses and innovation in wild black-capped chickadees

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## Introduction

Does necessity drive innovation? Innovation refers to one's propensity of solving problems. Innovation is a key concept in ecology and evolution as it influences a species' persistence within a novel or changing environment. While species differences in innovativeness has been well-studied, little is known on individual drivers of innovation within species.

The 'necessity drives innovation' hypothesis states that competitive individuals have easier access to limited resources and will therefore be less innovative as the majority of their requirements are often being met. In this study, black-capped chickadees (*Poecile atricapillus*) were used to determine how individual differences related to necessity impacted novelty responses, i.e. neophobia, and persistence during innovative problem-solving. "Neophobia" refers to the likelihood of approaching a novel task while "persistence" refers to the repeated action in solving that novel task.

The prediction tested in this study is that subordinate individuals, i.e. females and juveniles will contact a novel problem quicker, be involved in a greater number of attempts, and be more likely to solve the problem than their dominant counterparts, the males and adults.

## Methodology

- Innovative problem-solving trials conducted at three outdoor field sites (LNP, BB, Sand Road)
- Black-capped chickadees marked using coloured-bands on both legs
- Novel foraging tasks (sliding door, cup –lifting; see Figure 1) installed on two wooden platforms
- Actions recorded from videos: Land= landing on one of the two platforms without contacting the task, Attempt= contacting the task for greater than 2 seconds, Solve= solving the task and retrieving a seed

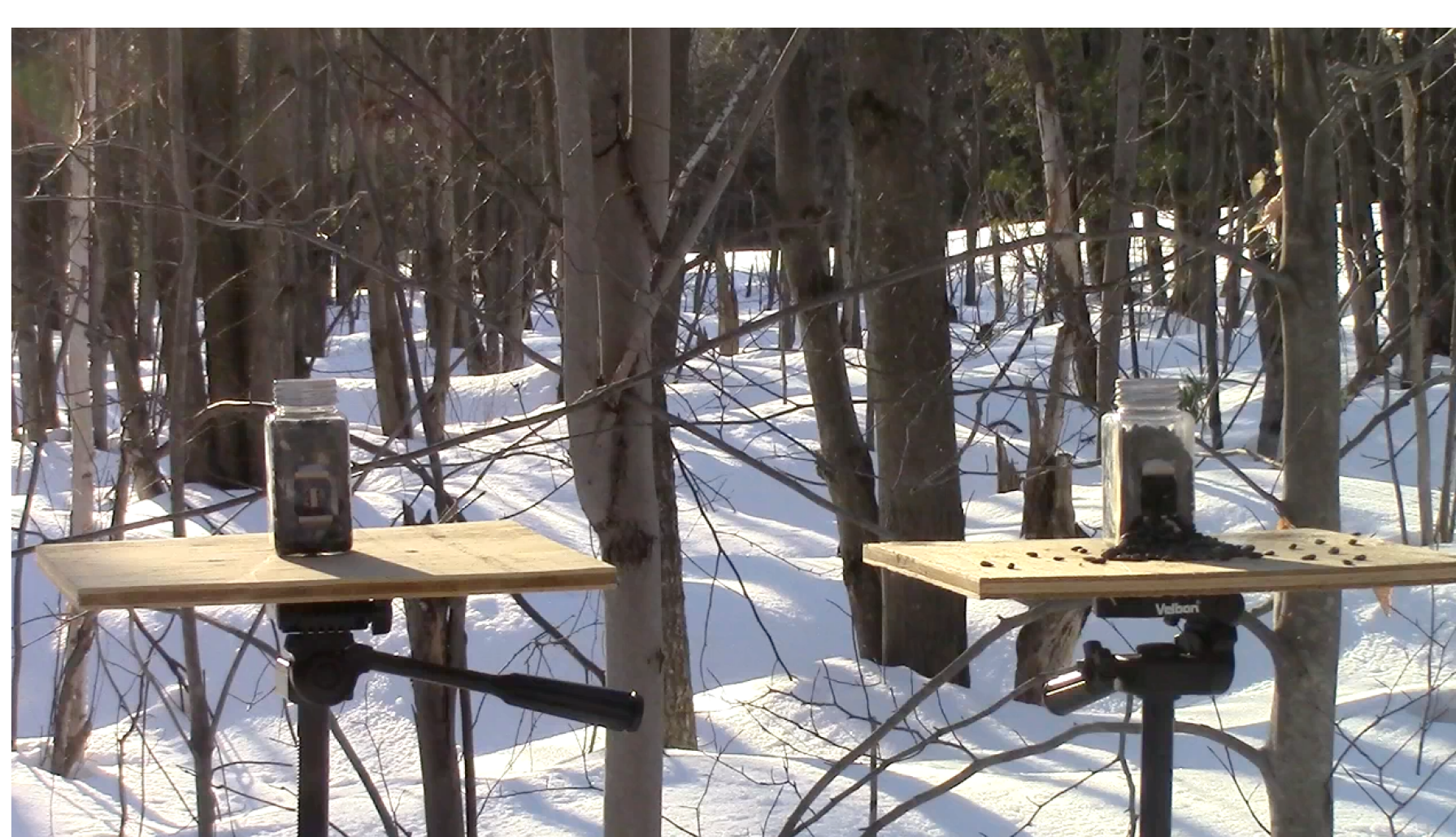


Figure 1. Two wooden platforms containing "sliding door task"

## Results

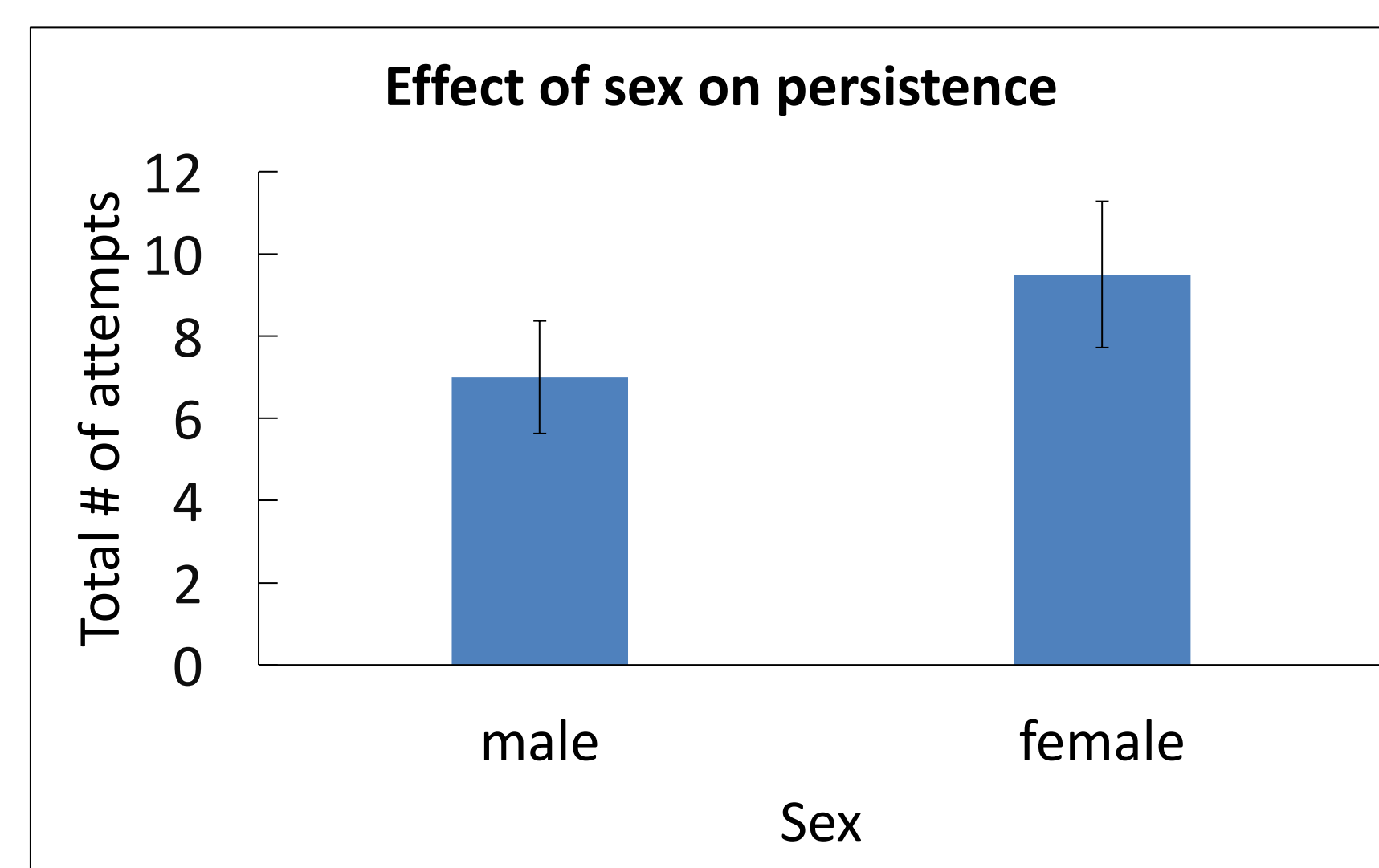


Figure 2. Effect of sex on persistence. The mean ± S.E. number of problem-solving attempts for each sex at three sites (N=18).

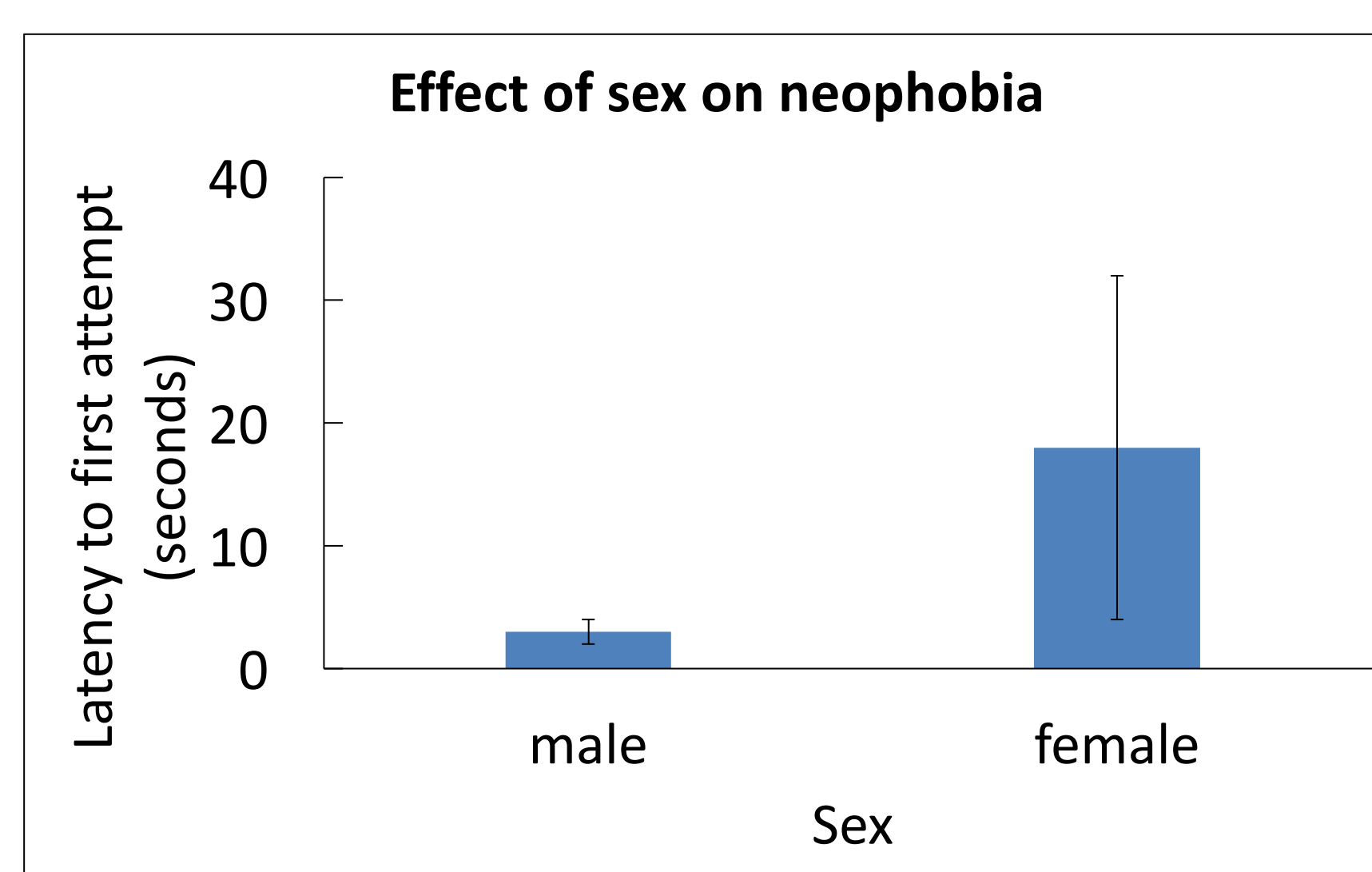


Figure 3. Effect of sex on neophobia. The mean ± S.E. latency period for each sex at three sites (N=6).

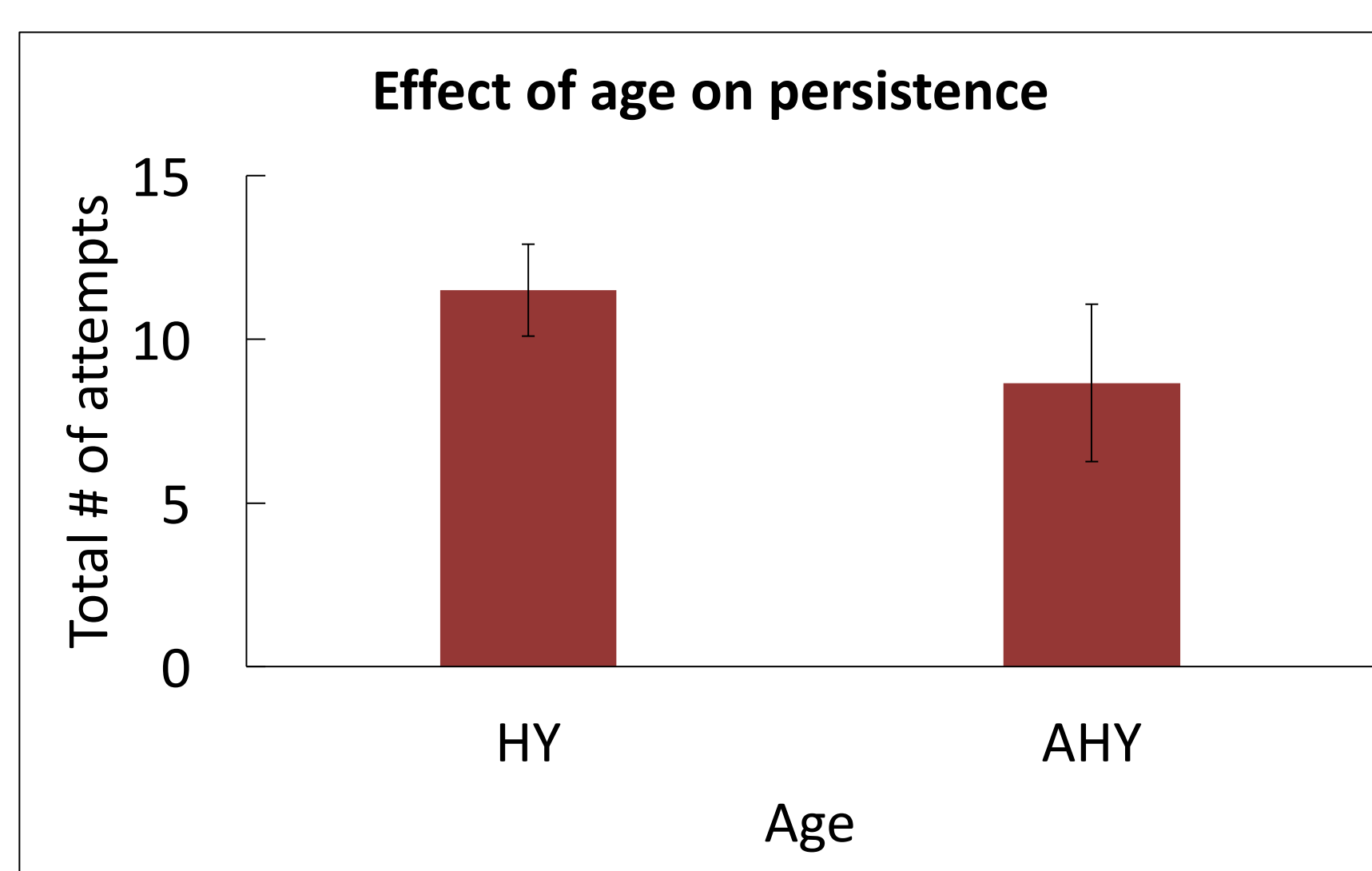


Figure 4. Effect of age on persistence. The mean ± S.E. number of problem solving attempts for each age group at three sites (N=18). Note: HY (hatch-year) represents the juveniles and AHY (after-hatch-year) represents the adults.

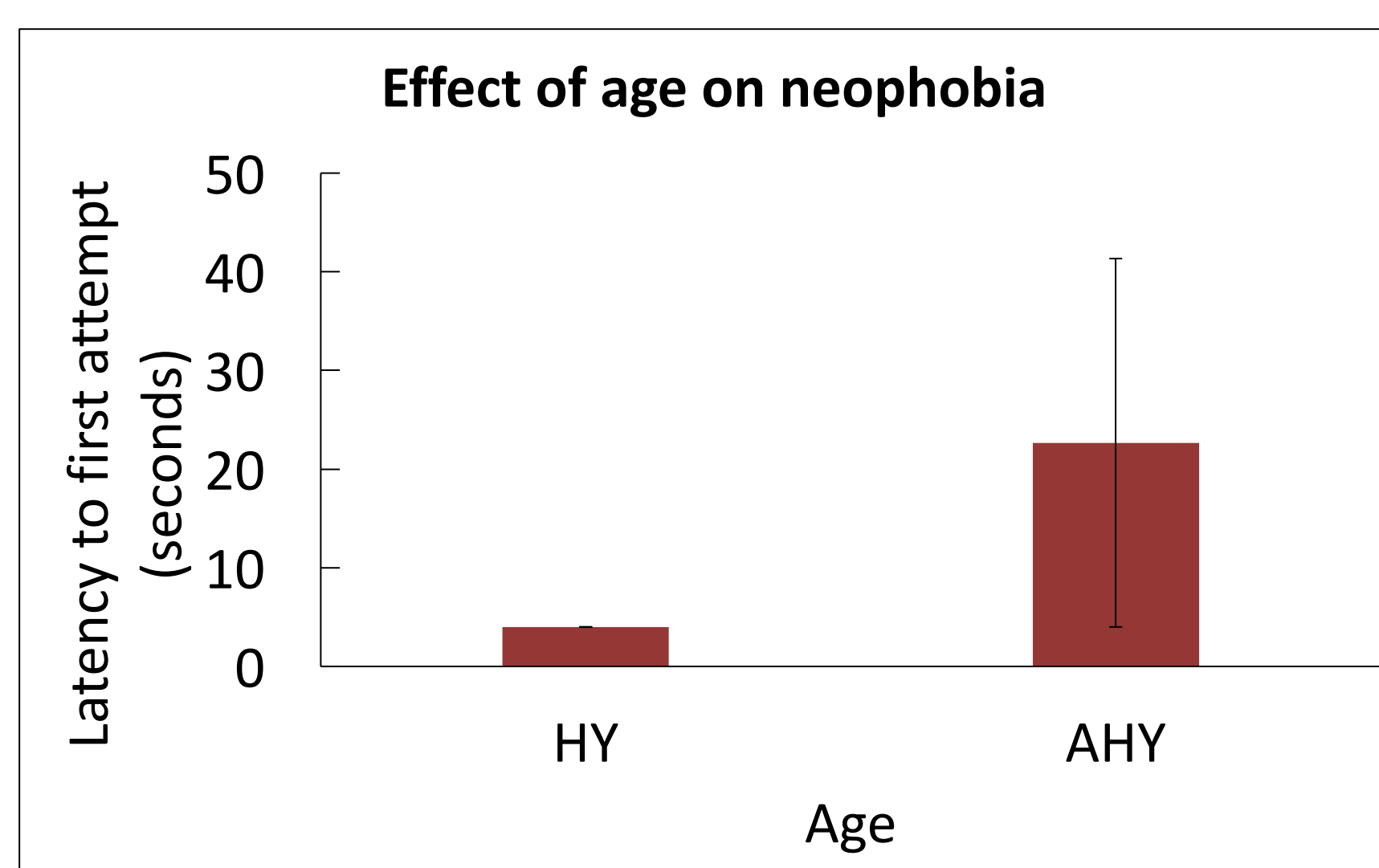


Figure 5. Effect of age on neophobia. The mean ± S.E. latency period for each age group at three sites (N=6). Note: HY (hatch-year) represents the juveniles and AHY (after-hatch-year) represents the adults.

A linear model on the mean number of problem-solving attempts revealed a non-significant effect of sex ( $p=0.54$ ) and of age ( $p=0.46$ ). A linear model of the mean latency period also revealed a non-significant effect of sex ( $p=1.00$ ) and age ( $p=0.67$ ).

## Conclusion

- Age and sex are not significantly related to innovation in black-capped chickadees
- The 2 predictions based on the "necessity drives innovation hypothesis" are not supported by these findings
- Possibility of contribution of other factors such as dominance, species type, etc. The hypothesis for this study can be assessed using dominance rank

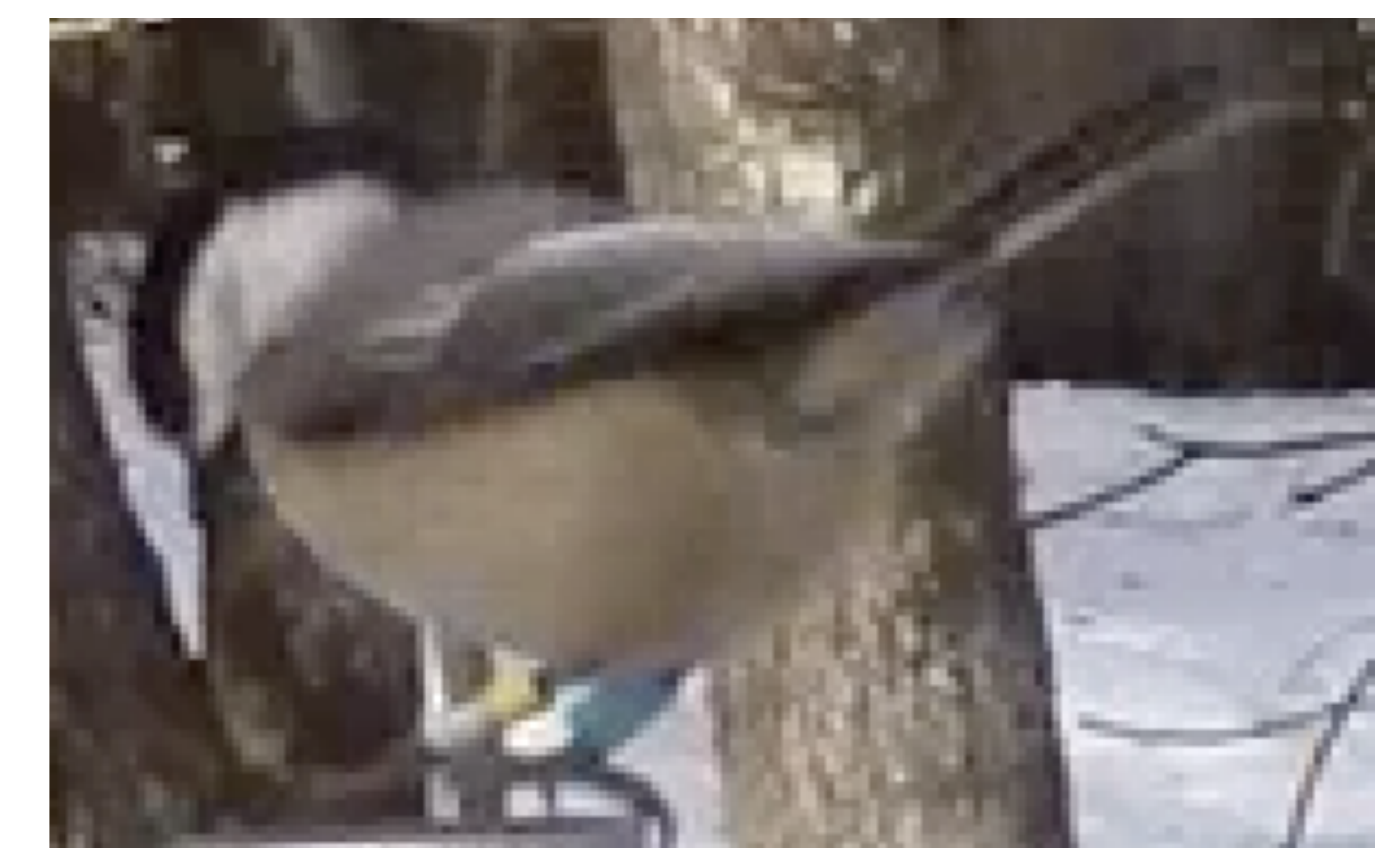


Figure 6. Marked black-capped chickadee (right leg=blue, left leg= yellow, silver)

## References

- Laland, K. N., & Reader, S. M. (1998). Foraging innovation in the guppy. *Animal Behaviour*, 331-338. Retrieved March 24, 2018.
- Morand-Ferron, J., Cole, E. F., Rawles, J. E., & Quinn, J. L. (2011). Who are the innovators? A field experiment with 2 passerine species. *Behavioural Ecology*, 1241-1246. Retrieved March 24, 2018.

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## Contact info

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