



# Body size correlates negatively with bioacoustic measures of *tseet* calls of black-capped chickadees (*Poecile atricapillus*)

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## Introduction

- Black-capped chickadees are common North American songbirds that learn their vocalizations similarly to how humans learn speech.

### Vocalizations

#### Calls

Typically short, acoustically simple, and used in numerous situations

#### Songs

Typically long, acoustically complex, and used more often in the mating season

#### Tseet

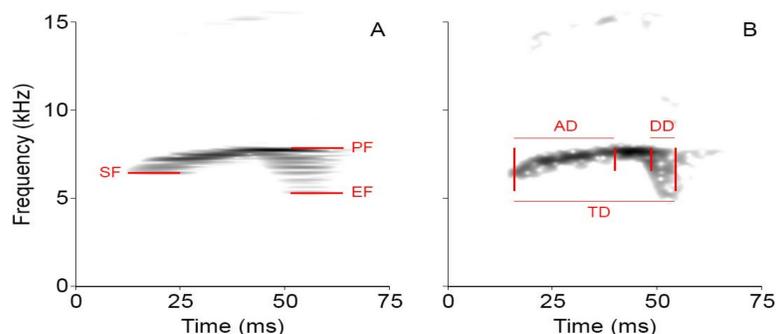
Primary function is to maintain contact at short distances.

## Research question

Does a chickadee's body size affect the acoustic features of the *tseet* calls it produces?

## Procedure

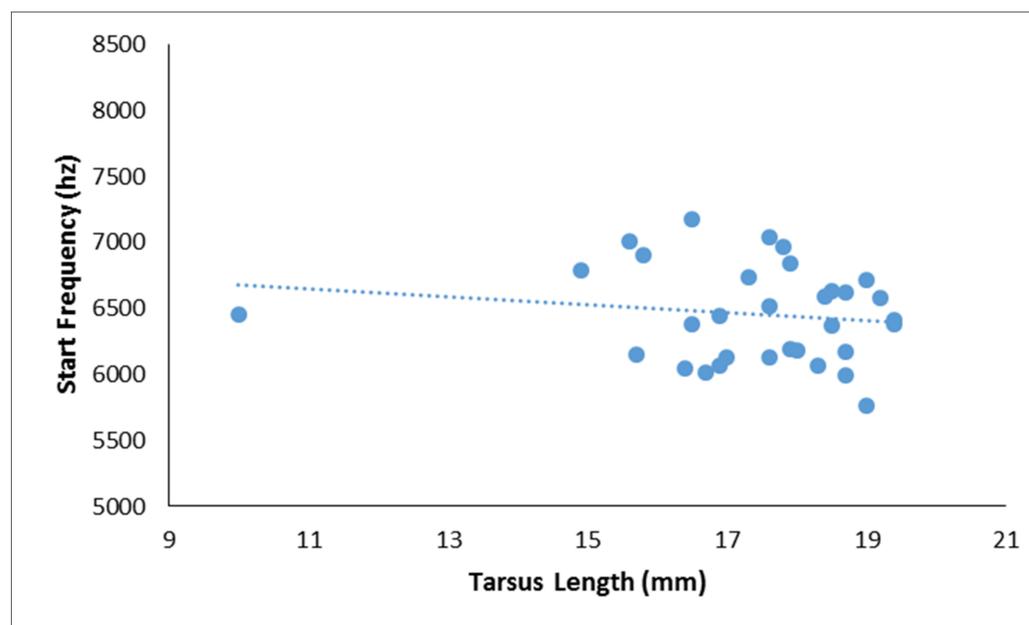
- Twenty-two *tseet* calls were randomly selected for each of 32 birds (16 male, 16 female).
- In SIGNAL v.5 calls were standardized to 300 ms in duration, and seven acoustic features were measured.
- Tarsus length, which was measured upon capture (see Figure 4), was used as an approximation for body size.
- A tarsus length x acoustic feature regression was conducted for each of the measured features.



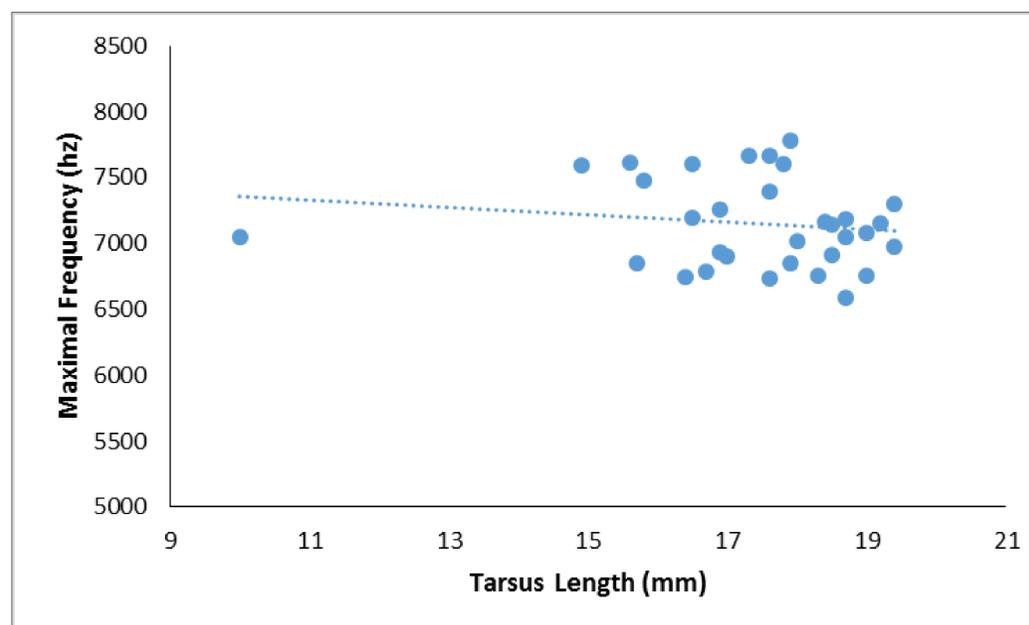
**Figure 1:** Acoustic measures made on *tseet* calls. (A) Spectrogram optimized for frequency precision showing measures for start frequency (SF), peak frequency (PF), and end frequency (EF). (B) Spectrogram optimized for duration precision showing measures for ascending duration (AD), descending duration (DD), and total duration (TD).

## Results

- There is a significant negative relationship between a chickadee's tarsus length and the start frequency ( $p < 0.001$ ; Figure 2), peak frequency ( $p < 0.001$ ), and maximal frequency ( $p < 0.001$ ; Figure 3) of the *tseet* calls they produce.
- There is no significant relationship between tarsus length and any duration measure.



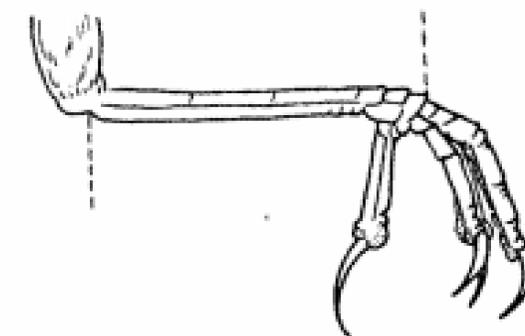
**Figure 2:** Start frequency (hz) decreases as tarsus length (mm) increases ( $p < 0.001$ ).



**Figure 3:** Maximal frequency (hz) decreases as tarsus length (mm) increases ( $p < 0.001$ ).

## Conclusion

- There is a negative correlation between the body size (approximated using tarsus length) and the start, peak, and maximal frequency of the *tseet* calls that chickadees produce.
- These results support the findings of ongoing research regarding similarly structured A notes of *chick-a-dee* calls, where body size also correlated with frequency.
  - Since both *chick-a-dee* A notes and *tseet* calls are produced normally even in acoustic isolation, variation in call frequency may be constrained by body size (e.g., the length of the syrinx).
- A negative correlation between body size and vocalization frequency is commonly observed in songbirds, as well as in numerous other groups.



**Figure 4:** An illustration of the measure of tarsus length on a chickadee leg.

## Acknowledgements

