

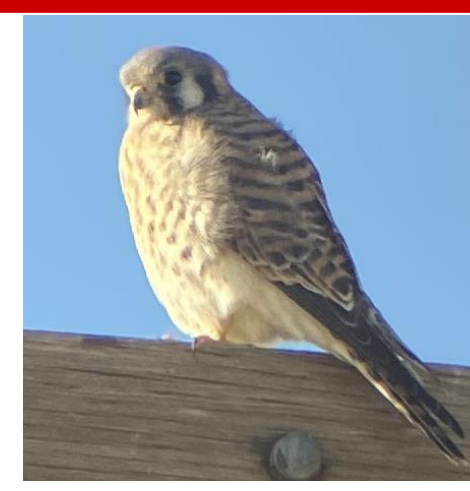


Female *Falco s. sparverius*
(photo by M. Waller, Northern Utah)

Seasonal Variation of Anti-parasite Behavior in American Kestrels

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Female *Falco s. sparverius*
(photo by M. Waller, Northern Utah)



Introduction

- Preening with the beak is an important anti-parasite behavior in birds, and is the first line of defense against ectoparasites¹.
- Preening is extremely effective at damaging and removing ectoparasites such as feather lice^{2,3}. Despite the documented fitness costs of infestation⁴ and the frequent nature of preening across birds, population level variation in preening behavior is rarely studied in wild populations.
- We sought out to study the variation of an anti-parasite behavior within and between geographically disparate populations of American kestrels.
- The American kestrels in the Bahamas are the subspecies *Falco sparverius sparveroides*, are non-migratory and do not face harsh winters while the kestrels in Utah are *Falco sparverius sparverius* face harsher winters, and many individuals are migratory.

Methods

- We trapped and uniquely marked American kestrels with color bands in in San Salvador, Bahamas, in Northern Utah.
- Ectoparasite loads were quantified by visual census of the flight feathers for louse eggs and live feather lice⁵.
- After a waiting period of at least 10 days, we observed individuals for at least 30 minutes and behavior was categorized and timed using Animal Behavior Pro⁶.
- Behaviors were summarized by individual for each season (breeding/non-breeding)
- In the Bahamas, many of individuals caught in the breeding season were also observed in the non-breeding season, but due to the migratory nature of many kestrels in Utah, only one individual was observed across both seasons.



Male *Falco sparverius sparveroides*
(photo by D. Clayton, San Salvador)

Results

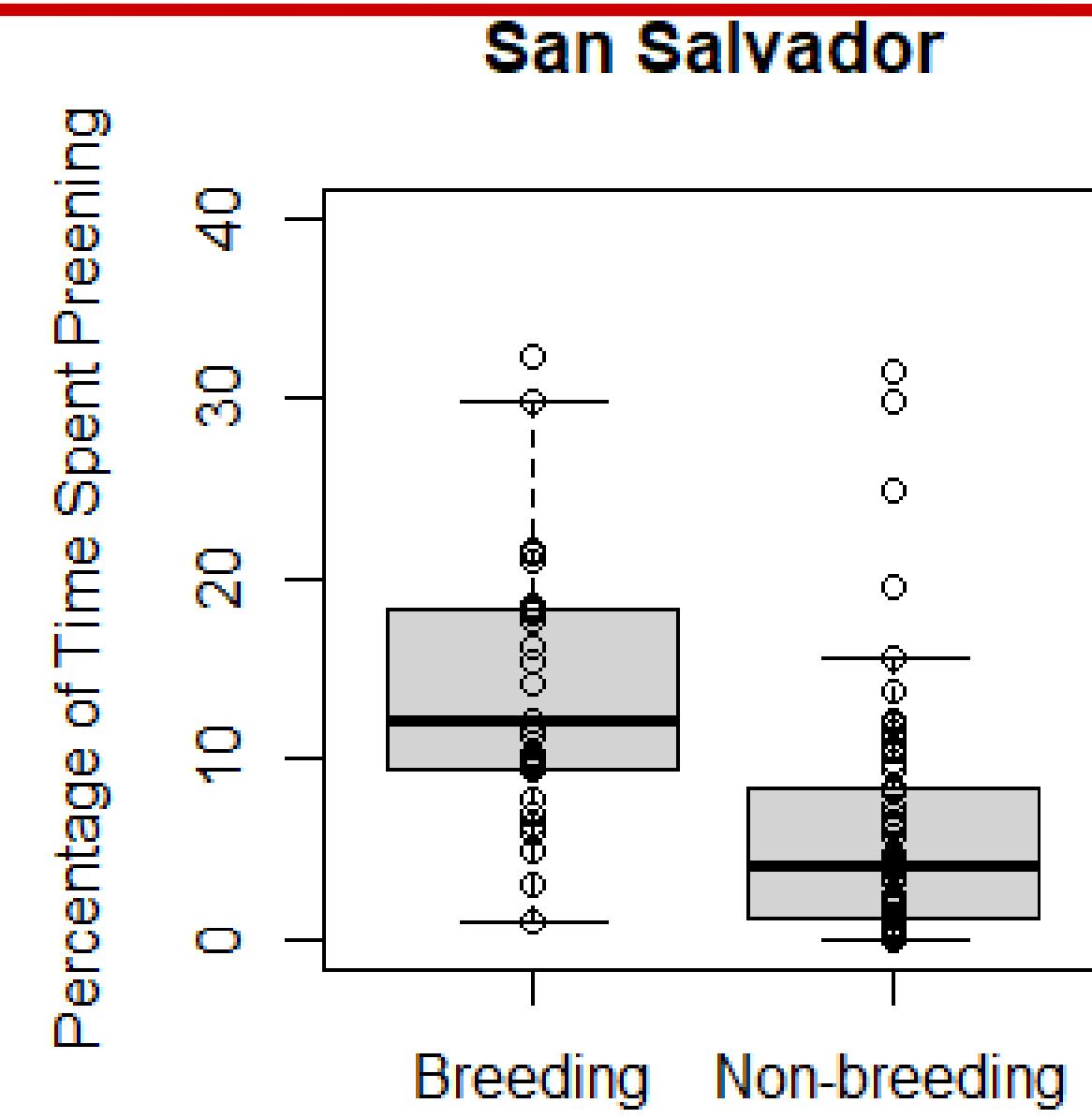


Fig. 1. Box plot of percentage of time spent preening in San Salvador by season.

n breeding season=29 n non-breeding season=63
Welch's t-test p-value = 4.395e-05***

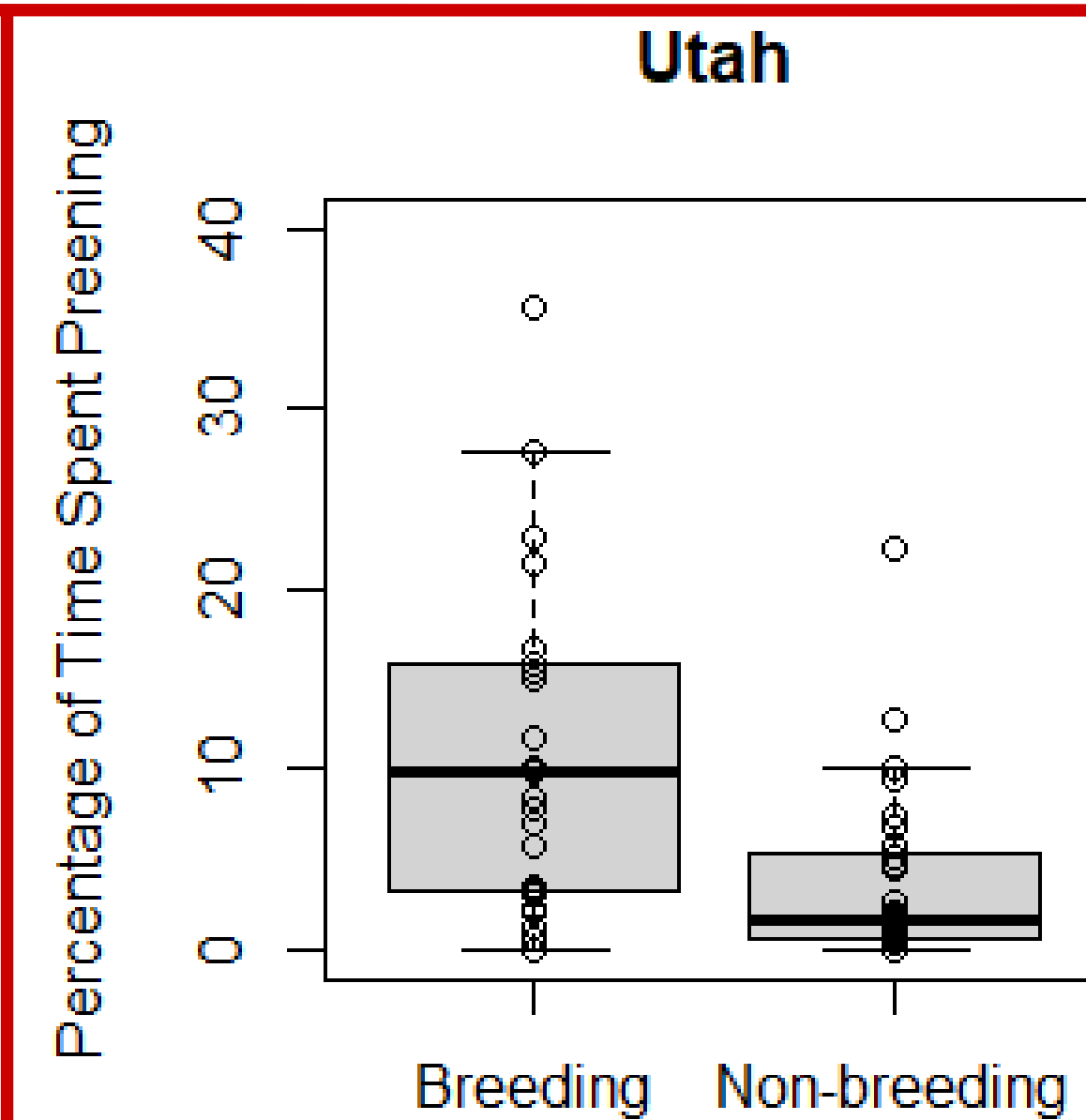


Fig 2. Box plot of percentage of time spent preening in Utah by season.

n breeding season=25 n non-breeding season=27
Welch's t-test p-value = 0.0026***

- Figs. 1, 2 show the percentage of time spent preening in each site by season. In both sites we see significantly less time devoted to preening in the non-breeding season. Significant seasonal differences were also seen for the average length of a preening bout and the rate at which bouts were initiated (data not shown).
- This large difference between seasons is striking and might be influenced by the need for increased antimicrobial defenses in the breeding season, and/or sexual selection.
- In addition to ectoparasites, birds face damage to their plumage from the microbial environment such as feather degrading bacteria and fungi which can cause negative fitness effects⁷.
- Preening is an anti-parasite behavior but also serves to spread preen oil from the uropygial gland across the feathers.
- In addition to water proofing, preen oil also has antimicrobial properties. The composition of preen oil varies substantially by season and may have greater antimicrobial properties in the breeding season^{8,9}. The amount of preen oil secreted also varies by season⁸ and birds increase their preening in response to the presence of feather degrading bacteria¹⁰.

Results cont.

- During the breeding season, kestrels may be exposed to more feather degrading microbes in the nest environment. Investing more in microbial defenses by preening more frequently could increase fitness. Outside the breeding season, the need for an increased microbial defenses might be lower and could drive the observed differences in preening in American kestrels.
- There is also the possibility that this increase in preening might not be related to microbial or ectoparasite defense. Kestrels may preen more in the breeding season because of the need to have plumage in good condition and arranged properly to attract a mate.

Conclusions and Future Directions

- Kestrels preen less, initiate fewer preening bouts, and preening bouts are shorter in the nonbreeding season.
- Experimental manipulation is needed to determine the drivers of seasonal variation in preening behavior. Increased needs for antimicrobial defenses and/or the need to look good to attract a mate may contribute to the observed increase in preening in the breeding season.
- Future work includes traveling to San Salvador July of 2021 to resight birds and assess relationships between survival, parasite load, and preening behavior.

References and Acknowledgements

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