Active nest sites of Olive-sided Flycatchers (*Contopus cooperi*) in central Alaska have greater insect diversity than historical sites.

Adam Haberski[1], Miles McHugh[1], Julie Hagelin[2], Derek Sikes[1]

[1] University of Alaska Museum, [2] Alaska Department of Fish & Game

Introduction

- The Olive-sided Flycatcher (*Contopus cooperi*) is a highly-specialized insectivorous bird in boreal forests that has experienced a steep (~70%) decline in recent decades [1, 2]. Cause of decline is unknown, but arthropod prey and/or prey availability has been linked to nest success [3].
- Alaska Department of Fish & Game studied *C. cooperi* in central Alaska in the 1990s [4]. Surveys 25 years later indicate past sites no longer support breeding pairs, but other sites do.
- Habitat changes affecting local insect communities could make sites unsuitable for breeding. A comparison of presently "active" nesting sites to "historical" sites (that lack breeders) may reveal parameters of insect prey associated with successful breeding.

The goal of this study was to compare active and historical flycatcher nest sites to detect any differences in:

1. **Diversity of the arthropod community**
2. **Arthropod biomass**

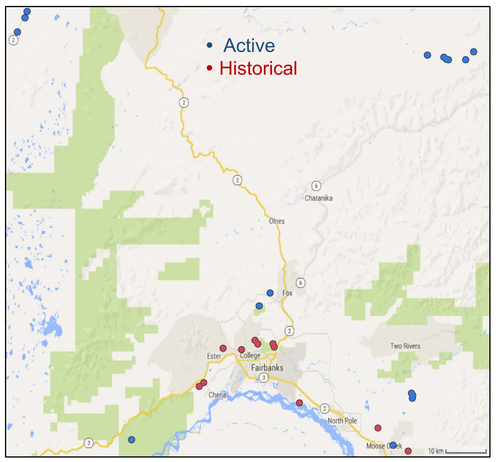


Figure 1: Arthropod collection sites sampled from 2013-2015 in central Alaska (near the city of Fairbanks).

Figure 2: Olive-sided Flycatcher caught for banding by Alaska Department of Fish & Game (Photo: J. Hagelin).

Methods

Study Sites

New active sites were discovered each year. Historical sites remained constant, but their accessibility changed from year to year (e.g. due to high water).

- **2013**: 14 nest sites: 5 active and 9 historical
- **2014**: 23 nest sites: 13 active and 10 historical
- **2015**: 18 nest sites : 11 active and 7 historical

Insect Collection

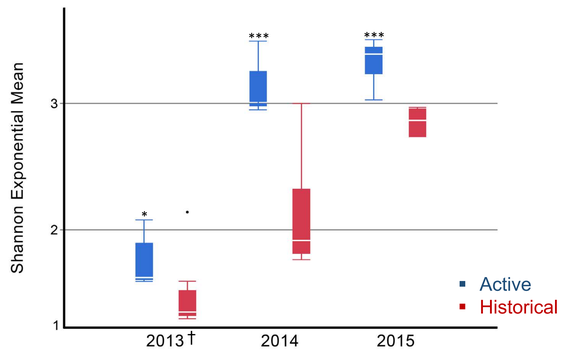
- Samples collected from June to July at 2 week intervals.
- 1 hanging Malaise trap and 6 pollinator vein traps were set within 100m of nest sties. No pollinator traps deployed in 2013.
- Body length (mm) converted to biomass (mg) via the formula ($[(\text{weight})=b_0*(\text{length})^b]$) [5].
- Specimens < 3mm were excluded as unlikely prey.
- All specimens accessioned into the University of Alaska Museum collection and made available to the public via ARCTOS.

Statistics

- 109,144 specimens analyzed.
- 3 measures of diversity used: richness, Shannon Diversity Index (exponential) and Simpson Diversity index [6].
- Rarified (extrapolated) diversity values generated in EstimateS, to control for differences in trapping effort [6].
- Biomass standardized by trap-day to control for differences in trapping effort.
- Wilcoxon ranked-sum tests run in JMP.

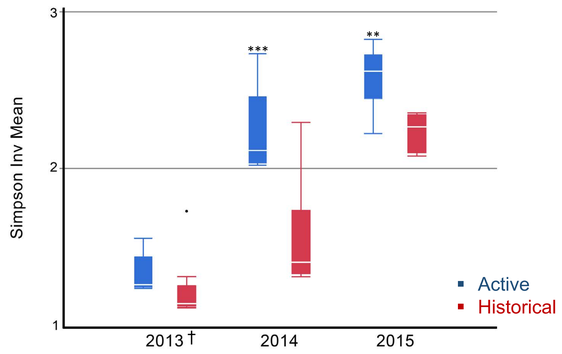
Results

Shannon Diversity Index (exponential)



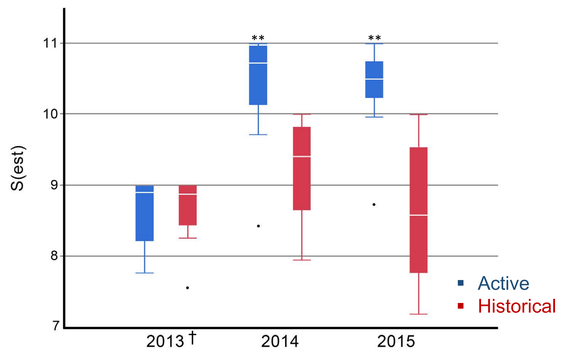
Pooled (all years): Active > Historical, s = 134, p ≤ 0.0001

Simpson Diversity Index



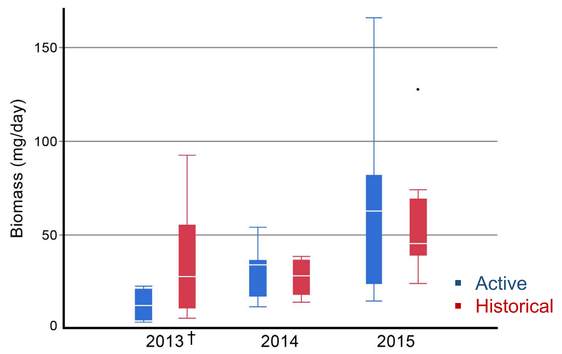
Pooled (all years): Active > Historical, s = 140.5, p ≤ 0.0001

Taxonomic Order Richness



Pooled (all years): Active = Historical, s = 227.5, p = 0.078

Biomass



Pooled (all years): Active = Historical, s = 286, p = 592

Figure 3: Boxplots represent median values and 25%-75% IQR. Whiskers denote max and min values, excluding suspected outliers (denoted by black dots). *p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001 for within-year comparison. † No pollinator traps were deployed in 2013 which contributed to lower values.

Conclusions

1. **Diversity of the arthropod community was significantly greater at active nest sites** than historical sites in 2014 and 2015.
2. **There was no difference in arthropod biomass.**

Future Question

Could greater arthropod diversity result in a wider variety of emergence times, creating a more "constant" food supply throughout the breeding season?

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