Arthropod abundance and diversity at active and historical nesting sites of Olive-sided Flycatchers (*Contopus cooperi)* in Alaska

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Introduction

Animals are dependent on a steady food source for survival and reproduction. The choice of breeding location likely reflects the availability of their food in areas where animals choose to breed. This steady food source is necessary for mate selection and the raising of offspring. Many birds migrate yearly from their wintering grounds to breeding grounds and some hypothesize that a driving force behind migration is the availability of food resources at the breeding grounds (Morse 1971). The Olive-sided Flycatcher (*Contopus cooperi)* is a migratory insectivorous bird that chooses areas in Alaska for breeding and nesting sites. It is considered a Sensitive Species or Species of Concern in Alaska (Wright 1997) and its choice of nesting site is important in understanding the species' decline. Gaining knowledge about what food is available at these sites may help explain why these birds select their nesting sites.

The goal of this study was to document the arthropod community biomass and diversity found at nesting sites of *C. cooperi* in Fairbanks, Anchorage, and Tetlin National Wildlife Refuge, Alaska.

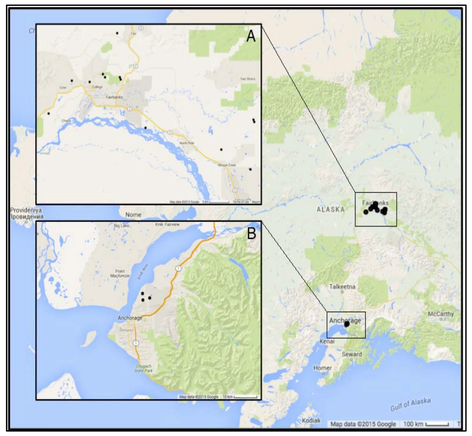


Figure 1: Locations of the 17 sample sites for 2013.

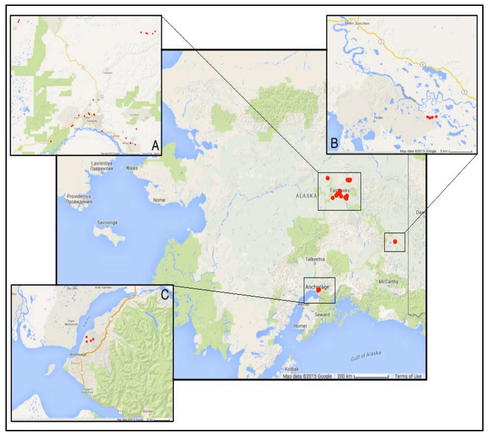


Figure 2: Locations of the 31 sample sites for 2014.

Methods

Study Sites

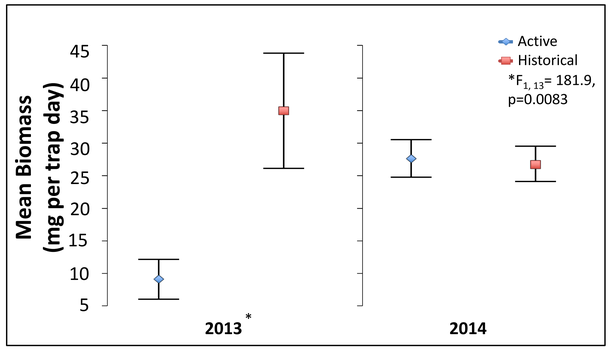
- 17 nest sites in 2013: 9 active and 8 historical (Fig. 1).
- 31 nest sites in 2014: 19 active and 12 historical (Fig. 2).

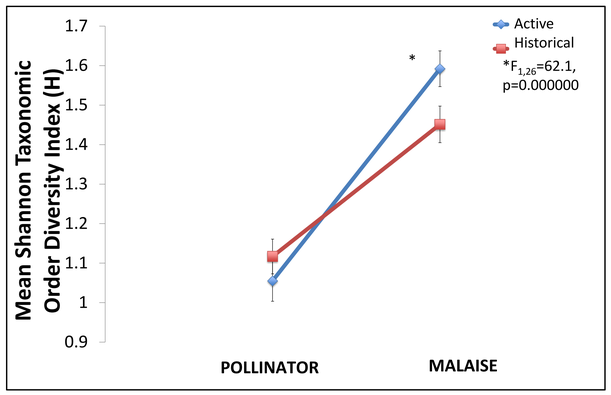
Insect Collection

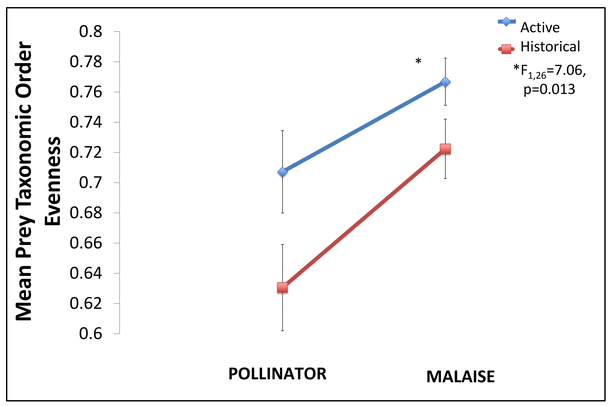
- Sample collection from early June to late July.
- 1 hanging Malaise trap set at each site in 2013.
- 1 hanging Malaise and 6 pollinator vane traps set at each site in 2014.
- Traps were set for approximately 2 week intervals.
- Arthropod samples were prepared and measured at the University of Alaska Museum using a Leica MZ16 microscope with a micrometer at 0.71x. Note that the oculars add a power of 10. These measurements were converted to mm (1 micrometer= 1.40845mm).
- Formulae for biomass ($[(\text{weight})=b_0*(\text{length})^b]$) was used to convert mm to mg (Rogers et al. 1977).
- All insects were integrated into the University of Alaska Museum insect collection after measurements.

Statistics

All statistics were performed using ANOVA; linear mixed-model fit by REML and checked for homogeneity of variance and normality.







Results

(Left) Figure 3: Mean biomass between active and historical sites in 2013 and 2014.

(Left) Figure 4: The 2014 year mean Shannon Taxonomic Order Diversity Index between pollinator and Malaise traps, and active and historical sites.

(Left) Figure 5: The 2014 year mean prey taxonomic order evenness between pollinator and Malaise traps, and active and historical sites.

(Right) Figure 6: The 2014 year abundance per taxonomic family between active and historical sites.

2013 Biomass

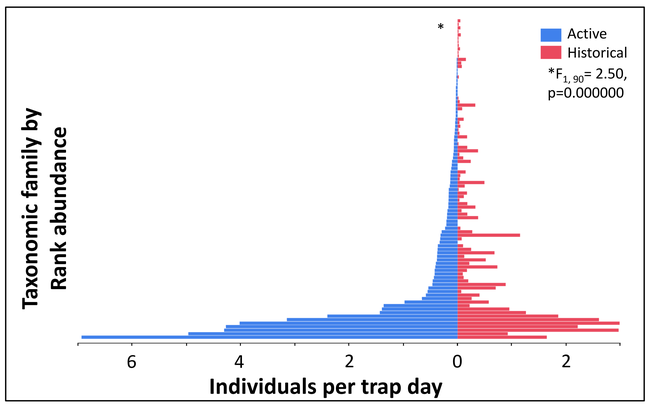
- Historical sites had higher mean biomass per trap day than active sites ($F_{1, 13}$= 181.9, p=0.0083).

2014 Biomass

- No difference in biomass between active and historical sites.
- The start date produced a significant effect ($F_{1,163}$=7.21, p=0.005) showing a biomass increase over time.

Diversity 2014

- The Shannon Diversity Index (H) differed between Malaise and pollinator traps. Malaise traps had higher scores than pollinator traps (Fig. 4).
- Between active and historical sites there was greater taxonomic order evenness at active sites. Malaise traps also had greater taxonomic order evenness than pollinator traps ($F_{1,26}$=9.7, p=0.004). (Fig. 5).
- Occupancy status (active or historical) has a significant effect on relative abundance of taxonomic families ($F_{1, 90}$= 2.50, p=0.000000). T-tests using a sequential Bonferroni adjustment for multiple tests showed no significant difference within any family. (Fig. 6).



Conclusion

- Active breeding sites of Olive-sided Flycatchers were associated with higher species diversity indices than historical sites (Fig. 4 & 5). The Shannon Diversity Index represents both species richness and evenness and it appears that active sites may contain a more "even" relative abundance of arthropod orders. If taxonomic orders have different emergence times, this might represent a more reliable or constant food source for the Olive-sided Flycatcher. Occupancy status has an affect on relative abundance at the taxonomic family level, but the biological mechanisms behind this are not clear.
- Biomass of arthropods did not differ between active and historical sites, but did differ by year, with 2013 traps catching more insects (Fig. 3). It appears that in this study biomass is not an indicator of bird occupancy. 2014 was one of the wettest summers on record while 2013 was a high burn year. It is possible that heavy rain reduced the activity of aerial insects.
- Biomass and diversity do not appear to be predictors of bird occupancy.

Literature Cited

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